












				National Grid SA		الشركة الوطنية لنقل الكهرباء		
DESCRIPTION	<div><div><div><div>نقل الكهرباء</div><div>National Grid SA</div><div>إحدى شركات الشركة السعودية للكهرباء</div><div>Subsidiary of Saudi Electricity Company</div></div></div></div>							
	FINAL							
	SCOPE OF WORK AND TECHNICAL SPECIFICATIONS							
	FOR							
	PURCHASE CONTRACT FOR EHV TRANSFORMERS AND REACTORS							
PTS - 24CM335								
NO.	1	2	3					
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DEPARTMENT				ENGINEERING & DESIGN DIVISION-EOA				
ENGINEERING & DESIGN				ENGINEERING & DESIGN DEPARTMENT				
PREPARED BY				ENGINEERING & PROJECTS DEVELOPMENT SECTOR				
Project Engineers				ENGINEERING & ASSET MANAGEMENT BL				
				NATIONAL GRID SAUDI ARABIA				
KUMAIL N. ALFASHKHI								
DATE: 15 / 08 / 2024								
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DRAWING CONTROL SHEET				FINAL SOW/TS FOR PURCHASE CONTRACT FOR EHV TRANSFORMERS AND REACTORS				
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	SOW/TS APPENDICES								
	APPENDIX NO.		APPENDIX TITLE			REMARK			
	APPENDIX-1		DRAWING CONTROL SHEET & DRAWINGS						
	APPENDIX-2		MATERIAL DATA SCHEDULES						
	APPENDIX-3		PROTECTION REQUIREMENTS						
	APPENDIX-4		TRAINING REQUIREMENTS						
	APPENDIX-5		OPERATIONAL SPARE PARTS REQUIREMENTS						
	APPENDIX-6		SPECIAL TOOLS & EQUIPMENT REQUIREMENTS						
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	SECTION 1 INTRODUCTION														
	1.1 GENERAL INTRODUCTION														
	This Scope of Work and Technical Specifications and associated PROJECT Conceptual Drawings, which are Attachment-I to Schedule "B" of this CONTRACT, describe the specific scope of work that the MANUFACTURER is required to carry out on Lump Sum Turnkey (LSTK) basis, until the successful commissioning, completion and final acceptance of WORK, by National Grid SA (hereafter referred to as COMPANY or NG).														
	1.2 CONTRACT DESCRIPTION														
	This CONTRACT is intended to supply COMPANY with the following Auto Power Transformers/Power Transformers and Reactors which will be used by SUBSTATION CONTRACTORS for construction of substations, in different areas of Kingdom of Saudi Arabia.														
	<ul style="list-style-type: none">302.5/402.5/502.5 MVA, 380/132/13.8 kV, YNa0d1302.5/402.5/502.5 MVA, 380/115/13.8 kV, YNa0d1302.5/402.5/502.5 MVA, 380/110/13.8 kV, YNa0d180/100 MVA, 380/33 kV, YNyn0+d160/80/100/120/150 MVAR, 380kV Bus Shunt Reactor60/80/100/120/150 MVAR, 380kV Line Reactor														
	1.3 CONTRACT SUMMARY														
	The MANUFACTURER shall design, engineer, manufacture, factory test, supply and supervise installation, testing & commissioning of auto Power Transformers/Power Transformers & reactors equipment complete with all accessories along with all associated work and services in a satisfactorily manner as specified in this scope of work and technical specifications.														
	1.4 DEFINITION OF TERMS														
Terms, abbreviations and/or expressions frequently used in this document shall have the following meaning:															
<table><tr><th>TERMS/ ABBREVIATION/ EXPRESSIONS</th><th>MEANING</th></tr><tr><td>COMPANY</td><td>National Grid SA (Subsidiary of Saudi Electricity Company)</td></tr><tr><td>SEC</td><td>Saudi Electricity Company</td></tr><tr><td>PROJECT</td><td>Construction and/or reinforcement of substation(s) to be carried out by SUBSTATION CONTRACTOR</td></tr><tr><td>SUBSTATION CONTRACTOR (or CONTRACTOR)</td><td>Contractor responsible for the installation of Auto Power Transformers/Power Transformers/Reactors equipment and construction of new substations in different areas of Kingdom of Saudi Arabia</td></tr></table>						TERMS/ ABBREVIATION/ EXPRESSIONS	MEANING	COMPANY	National Grid SA (Subsidiary of Saudi Electricity Company)	SEC	Saudi Electricity Company	PROJECT	Construction and/or reinforcement of substation(s) to be carried out by SUBSTATION CONTRACTOR	SUBSTATION CONTRACTOR (or CONTRACTOR)	Contractor responsible for the installation of Auto Power Transformers/Power Transformers/Reactors equipment and construction of new substations in different areas of Kingdom of Saudi Arabia
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				National Grid SA						
DESCRIPTION				MANUFACTURER	Manufacturer responsible for the execution of the WORK as described in this PTS					
				JOB SITE/WORK SITE	Substation SITE					
				ASTM	American Society for Testing and Materials					
				HV	Primary side of Auto Power Transformers/ Power Transformers					
				LV	Secondary Side of Auto Power Transformers/Power Transformers					
				TV/MV	Tertiary side					
				Auto Power Transformers	Supper Grid Transformers					
				Power Transformers	Grid Transformers					
				Asym.	Asymmetrical					
				AVC	Automatic Voltage Control					
				BCP	Bay Control Panel					
				BCU	Bay Control Unit					
				COMPANY REPRESENTATIVE	Personnel Authorized by COMPANY					
				CT	Current Transformer					
				CTR	Current Transformer Ratio					
				DCS	Drawing Control Sheet					
				GT	Grid Transformer					
				GIS	Gas Insulated Switchgear					
				IEC	International Electrotechnical Commission					
				IED	Intelligent Electronic Device					
				IEEE	Institute of Electrical and Electronics Engineers					
				IFC	Issued for Construction					
				kA	Kiloampere					
				kV	Kilovolt					
				kVA	Kilo Volt Ampere					
				LCC	Local Control Cabinet					
				LCP	Local Control Panel					
				LOTAM	List of Technically Acceptable Manufacturers and Manufacturer Plants					
				LSTK	Lump Sum Turnkey					
				mH	Millihenries					
				MVA	Mega Volt Ampere					
				MVar	Mega Volt Ampere Reactive					
				MVarh	Mega Volt Ampere Reactive Hours					
			MW	Megawatt						
			MWh	Megawatt Hours						
			O/H	Overhead						
			OLTC	On-Load Tap Changer						
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	<table><tr><td>p.u.</td><td>Per unit</td></tr><tr><td>PTS</td><td>Project Technical Specifications</td></tr><tr><td>QA/QC</td><td>Quality Assurance/Quality Control</td></tr><tr><td>RTCC</td><td>Remote Tap Changer Control</td></tr><tr><td>S/S or SS</td><td>Substation</td></tr><tr><td>SA</td><td>Surge Arrestor</td></tr><tr><td>SASO</td><td>Saudi Arabian Standards Organization</td></tr><tr><td>SCADA</td><td>Supervisory Control and Data Acquisition</td></tr><tr><td>SEEDS</td><td>SEC Engineering Drawings Standard</td></tr><tr><td>SOW/TS</td><td>Scope of WORK and Technical Specifications</td></tr><tr><td>sq.mm</td><td>Square millimeters or Square mm or mm2</td></tr><tr><td>SGT</td><td>Super Grid Transformer</td></tr><tr><td>TCS</td><td>COMPANY Transmission Construction Standard</td></tr><tr><td>TES</td><td>COMPANY Transmission Engineering Standard</td></tr><tr><td>TFR or DFR</td><td>Transient Fault Recorder or Digital Fault Recorder</td></tr><tr><td>TMSS</td><td>COMPANY Transmission Materials Standard Specification</td></tr><tr><td>TSD</td><td>COMPANY Transmission Standard Drawings</td></tr><tr><td>T/L, T/Line</td><td>Transmission Line</td></tr><tr><td>U/G or UG</td><td>Underground</td></tr><tr><td>WP</td><td>Work Package</td></tr><tr><td>X/R</td><td>The ratio of reactance to resistance</td></tr><tr><td>XFMR</td><td>Transformer</td></tr></table>									p.u.	Per unit	PTS	Project Technical Specifications	QA/QC	Quality Assurance/Quality Control	RTCC	Remote Tap Changer Control	S/S or SS	Substation	SA	Surge Arrestor	SASO	Saudi Arabian Standards Organization	SCADA	Supervisory Control and Data Acquisition	SEEDS	SEC Engineering Drawings Standard	SOW/TS	Scope of WORK and Technical Specifications	sq.mm	Square millimeters or Square mm or mm2	SGT	Super Grid Transformer	TCS	COMPANY Transmission Construction Standard	TES	COMPANY Transmission Engineering Standard	TFR or DFR	Transient Fault Recorder or Digital Fault Recorder	TMSS	COMPANY Transmission Materials Standard Specification	TSD	COMPANY Transmission Standard Drawings	T/L, T/Line	Transmission Line	U/G or UG	Underground	WP	Work Package	X/R	The ratio of reactance to resistance	XFMR	Transformer
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	SECTION 2 <u>INTERFACE REQUIREMENTS</u>									
	A. GENERAL									
	This section describes the scope of general interface of the Auto Power Transformers/Power Transformers and Reactors MANUFACTURERS /CONTRACTOR /COMPANY involved in this CONTRACT.									
	#	Work	MANUFACTURER	SUBSTATION CONTRACTOR	COMPANY					
	1.	Drawing Numbers	The MANUFACTURER'S drawings shall be assigned with drawing numbers and indexed as per COMPANY requirements (SEED-II). Each design package shall have dedicated drawing numbers.	The CONTRACTOR'S drawings shall be assigned with drawing numbers and indexed as per COMPANY requirements (SEED-II). The CONTRACTOR shall reflect the related MANUFACTURER drawings in the required related substation drawings.	A block of drawing numbers to be provided by the COMPANY for all new drawings/document s at various stages of EQUIPMENT design.					
	2.	EQUIPMENT Preliminary Design Package(s)	MANUFACTURER shall submit complete set(s) of EQUIPMENT preliminary design package(s) (Hard and soft copy) after the PURCHASE CONTRACT kick-off meeting. MANUFACTURER to arrange the EQUIPMENT preliminary design review meeting-		COMPANY to review the EQUIPMENT preliminary design package(s). COMPANY representatives to attend preliminary design review meeting. COMPANY to concur on the minutes of the meeting.					
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#	Work	MANUFACTURER	SUBSTATION CONTRACTOR	COMPANY			
		<p>MANUFACTURER'S representative(s) in each field of specification to attend the presentation meeting to finalize the EQUIPMENT preliminary design package(s).</p> <p>MANUFACTURER to prepare minutes of the meeting.</p>					
3.	EQUIPMENT Final Detail Design Package(s)	<p>MANUFACTURER shall submit complete set(s) of EQUIPMENT final detail design package(s) (Hard and soft copy) after finalizing the preliminary design.</p> <p>MANUFACTURER to arrange the EQUIPMENT final design review meeting.</p> <p>MANUFACTURER'S representative(s) in each field of specification to attend the presentation meeting to finalize the EQUIPMENT detail design package(s).</p> <p>MANUFACTURER to prepare minutes of the meeting.</p>		<p>COMPANY to review the EQUIPMENT final detail design package(s).</p> <p>COMPANY representatives to attend final detail design review meeting.</p> <p>COMPANY to concur on the minutes of the meeting.</p>			

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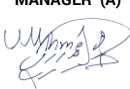
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#	Work	MANUFACTURER	SUBSTATION CONTRACTOR	COMPANY
4.	PROJECT(S) Base Design Package(s)	<p>MANUFACTURER'S representative(s) in each field of specification to attend the presentation meeting to finalize EQUIPMENT design of related PROJECT(S).</p> <p>MANUFACTURER to concur on the minutes of the meeting on points related to purchase contract equipment.</p>	<p>SUBSTATION CONTRACTOR shall submit the PROJECT(S) base design packages(s) (Hard and soft copy) after the PROJECT(S) kick-off meeting.</p> <p>SUBSTATION CONTRACTOR'S representative(s) in each field of specification to attend the presentation meeting to finalize PROJECT(S) base design.</p> <p>SUBSTATION CONTRACTOR to prepare minutes of the meeting.</p>	<p>COMPANY to review the PROJECT(S) base design package(s).</p> <p>COMPANY to arrange the PROJECT(S) review meeting.</p> <p>COMPANY to concur on the minutes of the meeting.</p>
5.	EQUIPMENT "As- Manufactured" Package(s)	MANUFACTURER shall submit complete set(s) of all drawings and documents (Hard and soft copy) stamped as "As-Manufactured" before EQUIPMENT factory inspection & testing (FAT).		COMPANY to review the EQUIPMENT "As-Manufactured" package(s).
6.	Quality control/Quality assurance Factory inspection and testing (FAT)	The MANUFACTURER shall submit to COMPANY quality control, inspection and testing plan of EQUIPMENT for COMPANY review.		<p>COMPANY to review and approve the quality control, inspection and testing plan.</p> <p>COMPANY to review and approve schedule for factory</p>

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				#	Work	MANUFACTURER	SUBSTATION CONTRACTOR	COMPANY					
						interaction between the COMPANY and QA/QC services CONTRACTOR(S) [Independent Inspection Agency(ies)]. MANUFACTURER shall hand over to COMPANY copy(ies) of EQUIPMENT test record book and copy(ies) of technical data manual.							
NO.				7.	EQUIPMENT "Final As- Manufactured" Package(s)	MANUFACTURER shall submit complete set(s) of all drawings and documents (Hard and soft copy) stamped as "Final As- Manufactured" after incorporating all the comments raised in "As- Manufactured" packages(s) and during FAT.		COMPANY to review EQUIPMENT "Final As- Manufactured" package(s).					
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				8.	EQUIPMENT "As- Built" Drawings	MANUFACTURER shall coordinate with the COMPANY for drawings marked with SITE changes. MANUFACTURER shall incorporate all the SITE changes, marked in "Noted By" drawings, in sufficient details to present an accurate record for the COMPANY and submit "As-Built"	SUBSTATION CONTRACTOR shall mark all the SITE changes in "Issued for Construction" drawings and shall handover them to COMPANY.	COMPANY to handover the SITE marked drawings to MANUFACTURER in order to prepare "As- Built" drawings in sufficient details to present an accurate record for COMPANY. COMPANY to review and approve "As- Built" drawings.					
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			drawings to the COMPANY.								
	9.	EQUIPMENT Design Package(s) Documents Format	MANUFACTURER shall provide all the equipment and interface drawings to COMPANY at every stage in MicroStation and PDF formats, as applicable.	SUBSTATION CONTRACTOR shall coordinate with the COMPANY for the necessary drawings to be incorporated in CONTRACTOR's design drawings at every stage, as applicable.	COMPANY to receive the drawings from MANUFACTURER at every stage in Microstation and PDF formats, as applicable.						
	10.	Auto Power Transformer/Power Transformers & Reactor Notification & Purchase Orders	MANUFACTURER to acknowledge the receiving of "Auto Power Transformer/Power Transformers & Reactor Notification" & "Purchase Order". MANUFACTURER shall not commence manufacturing activities of the ordered EQUIPMENT until the related Purchase Order is issued by the COMPANY.		COMPANY to issue "Auto Power Transformer/ Power transformers & Reactor Notification" of EQUIPMENT for specified PROJECT(S). COMPANY to issue related Purchase Order.						
	11.	EQUIPMENT Progress Report	MANUFACTURER to submit monthly progress reports in COMPANY approved formats (Hard and soft copy) to the responsible COMPANY representative. MANUFACTURER to attend coordination meeting(s) for	SUBSTATION CONTRACTOR to coordinate and follow up with COMPANY for EQUIPMENT progress. SUBSTATION CONTRACTOR to attend coordination meeting(s) for EQUIPMENT	COMPANY to coordinate and follow up with MANUFACTURER for EQUIPMENT progress and coordinate with SUBSTATION CONTRACTOR accordingly. COMPANY to arrange						
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			EQUIPMENT progress during the period of the PROJECT(S) as found necessary by COMPANY.	progress during period of the PROJECT(S). The SUBSTATION CONTRACTOR to prepare the minutes of all meetings for EQUIPMENT progress.		coordination meeting(s) for EQUIPMENT progress during the period of the PROJECT(S).				
	12.	Release for Shipment, Delivery & Handover	MANUFACTURER is responsible to arrange insurance, ship and deliver EQUIPMENT and unload the EQUIPMENT on foundation at SUBSTATION SITE in Saudi Arabia. ALL cost of custom clearance of EQUIPMENT and custom duties and fee to be borne by MANUFACTURER. MANUFACTURER shall not ship the EQUIPMENT until receiving a release for shipment certificate issued by COMPANY. MANUFACTURER shall coordinate with COMPANY for the delivery schedule. MANUFACTURER shall submit to COMPANY a document of	SUBSTATION CONTRACTOR is responsible for construction of EQUIPMENT foundation at SUBSTATION SITE. SUBSTATION CONTRACTOR is responsible to develop a safe yard/place where loose materials/panels/rel ays etc. shall be placed.		COMPANY to issue "Release for Shipment" certificate.				
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					EQUIPMENT handover to SUBSTATION CONTRACTOR. This document shall indicate PROJECT(S) information, purchase order reference, shipment certificate, time and date of handover and the status of EQUIPMENT packing with acknowledgement of SUBSTATION CONTRACTOR.				
			13.	Receipt Inspection	MANUFACTURER shall conduct receipt inspection of EQUIPMENT after delivery at PROJECT(S) SITE and during opening of EQUIPMENT packing. MANUFACTURER shall submit a receipt inspection report with SUBSTATION CONTRACTOR concurrence to the COMPANY. MANUFACTURER to receive the record of the impact recorder from the SUBSTATION CONTRACTOR, analyze the same and inform the COMPANY of his evaluation and findings.	SUBSTATION CONTRACTOR shall conduct receipt inspection of EQUIPMENT after delivery at PROJECT(S) SITE and during opening of EQUIPMENT packing. SUBSTATION CONTRACTOR shall remove/dismantle the impact recorder in the presence of the COMPANY representative and forward the records to the MANUFACTURER for further analysis. SUBSTATION CONTRACTOR shall repack the EQUIPMENT under	COMPANY to conduct receipt inspection of EQUIPMENT after delivery at PROJECT(S) SITE. COMPANY to witness removal/dismantling of the impact recorder and acknowledge receiving MANUFACTURER's evaluation for impact records.		
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				MANUFACTURER supervision, in case the foundation is not ready as per the committed schedule. SUBSTATION CONTRACTOR shall promptly report to the COMPANY any shipment and transportation damage.						
	14.	EQUIPMENT Replenish / Replacement	See Section 3.19	See Section 3.19		See Section 3.19				
	15.	Installation, Testing and Commissioning	MANUFACTURER shall provide complete SITE installation, testing and commissioning procedures of the EQUIPMENT supplied to SUBSTATION CONTRACTOR before shipment. MANUFACTURER shall conduct inspection and supervision of testing activities of EQUIPMENT at all phases and quality audit at appropriate stages of the PROJECT(S) construction/installation. Cost of MANUFACTURER supervisor(s) including air ticket to	Installation, testing and commissioning work of EQUIPMENT shall be borne by SUBSTATION CONTRACTOR under direct MANUFACTURER supervision. SUBSTATION CONTRACTOR shall intimate and notify MANUFACTURER in advance the supervision plan and the required date of supervisor availability at PROJECT(S) SITE.		All SITE testing and commissioning shall be done under COMPANY witness.				
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	#	Work	MANUFACTURER	SUBSTATION CONTRACTOR		COMPANY				
			PROJECT SITE(S) and back, VISA, insurance, food, accommodation, local transportation requirements from hotel to job site and back shall be arranged and borne by MANUFACTURER. MANUFACTURER shall obligate to SUBSTATION CONTRACTOR plan for supervision. The supervision duration of installation, testing and commissioning as per COMPANY specifications and requirements is: - 25 working man-days for one (1) transformer/Reactor EQUIPMENT.							
	16.	Operational Spare Parts	MANUFACTURER shall provide and deliver operational spare parts to designated COMPANY warehouse(s) in Saudi Arabia.			COMPANY to issue an order(s) for operational spare parts during PURCHASE CONTRACT.				
	17.	Special Tools/Test Equipment	MANUFACTURER shall provide and deliver special tools/test equipment to designated COMPANY warehouse(s), as			COMPANY to issue an order(s) for any special tools/test equipment during PURCHASE CONTRACT.				
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DRAWING CONTROL SHEET

				National Grid SA		الشركة الوطنية لنقل الكهرباء			
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					required by COMPANY. In case, the MANUFACTURER requires to perform any special test/check, MANUFACTURER shall provide/use his own tools/test equipment. MANUFACTURER shall be responsible for the insurance of the new special tools/test equipment(s) ordered by COMPANY up to final destination.				
			18.	Training	MANUFACTURER shall submit factory training program for COMPANY review and approval. MANUFACTURER shall arrange factory training complete with all required instructional materials and travelling requirements. SITE demonstration during installation and testing shall be conducted by MANUFACTURER supervisor(s).		COMPANY to issue an order(s) for factory training requirements during PURCHASE CONTRACT.		
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	<table><tr><th>#</th><th>Work</th><th>MANUFACTURER</th><th>SUBSTATION CONTRACTOR</th><th>COMPANY</th></tr><tr><td>19.</td><td>Warranty Certificate</td><td>MANUFACTURER shall provide COMPANY, a warranty certificate for the EQUIPMENT.</td><td></td><td>If COMPANY found the EQUIPMENT to be defective within the warranty period, COMPANY to arrange for warranty claim.</td></tr></table>								#	Work	MANUFACTURER	SUBSTATION CONTRACTOR	COMPANY	19.	Warranty Certificate	MANUFACTURER shall provide COMPANY, a warranty certificate for the EQUIPMENT.		If COMPANY found the EQUIPMENT to be defective within the warranty period, COMPANY to arrange for warranty claim.
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	<p>B. AUTO POWER TRANSFORMERS/POWER TRANSFORMERS EQUIPMENT WORK INTERFACE</p> <p>This section describes interface jobs/activities between the EQUIPMENT MANUFACTURER and SUBSTATION CONTRACTOR. These jobs/activities shall be coordinated through the COMPANY REPRESENTATIVE.</p>																	
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	C. REACTOR EQUIPMENT/WORK INTERFACE																							
	This section describes interface jobs/activities between the EQUIPMENT MANUFACTURER and SUBSTATION CONTRACTOR. These jobs/activities shall be coordinated through the COMPANY REPRESENTATIVE.																							
	<table><tr><th>#</th><th>Work / Equipment / Item</th><th>TRANSFORMER MANUFACTURER</th><th>SUBSTATION CONTRACTOR</th></tr><tr><td>1.</td><td>REACTOR</td><td>Design, engineer, manufacture, factory test, supply of reactor with all appurtenances and accessories. Provide supervision of the installation, testing and commissioning of the reactor with all associated works and services until the successful commissioning and final acceptance of the work by the COMPANY.</td><td>Installation, testing and commissioning of reactors with all appurtenances and accessories and all associated work and services until the successful commissioning and final acceptance of the work by the COMPANY.</td></tr><tr><td>2.</td><td>380kV cables (as applicable)</td><td>Provide suitable metallic cable glands with shrouds for sealing all cable entries at the enclosures.</td><td>Provide, install, splice, terminate, test and commission 380kV cables in reactors bushings/cable boxes (as applicable) including cable support structures and required grounding materials.</td></tr><tr><td>3.</td><td>Outdoor bushing connectors</td><td>Provide terminal hard wares and accessories suitable for 1 x 795 kcmil ACSR overhead conductors per phase on 380kV bushing of reactors (Air) including neutral bushing.</td><td>Provide, install, terminate, test and commission 1 x 795 kcmil ACSR overhead conductor per phase, with termination hard wares and accessories (for 380kV bushing (SF6/Cable/Air)) for connection between 380kV</td></tr></table>								#	Work / Equipment / Item	TRANSFORMER MANUFACTURER	SUBSTATION CONTRACTOR	1.	REACTOR	Design, engineer, manufacture, factory test, supply of reactor with all appurtenances and accessories. Provide supervision of the installation, testing and commissioning of the reactor with all associated works and services until the successful commissioning and final acceptance of the work by the COMPANY.	Installation, testing and commissioning of reactors with all appurtenances and accessories and all associated work and services until the successful commissioning and final acceptance of the work by the COMPANY.	2.	380kV cables (as applicable)	Provide suitable metallic cable glands with shrouds for sealing all cable entries at the enclosures.	Provide, install, splice, terminate, test and commission 380kV cables in reactors bushings/cable boxes (as applicable) including cable support structures and required grounding materials.	3.	Outdoor bushing connectors	Provide terminal hard wares and accessories suitable for 1 x 795 kcmil ACSR overhead conductors per phase on 380kV bushing of reactors (Air) including neutral bushing.	Provide, install, terminate, test and commission 1 x 795 kcmil ACSR overhead conductor per phase, with termination hard wares and accessories (for 380kV bushing (SF6/Cable/Air)) for connection between 380kV
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	1.	REACTOR	Design, engineer, manufacture, factory test, supply of reactor with all appurtenances and accessories. Provide supervision of the installation, testing and commissioning of the reactor with all associated works and services until the successful commissioning and final acceptance of the work by the COMPANY.	Installation, testing and commissioning of reactors with all appurtenances and accessories and all associated work and services until the successful commissioning and final acceptance of the work by the COMPANY.																				
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PREPARED BY Project Engineers KUMAIL N. ALFASHKHI DATE: 15 / 08 / 2024																								
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		#	Work / Equipment / Item	TRANSFORMER MANUFACTURER	SUBSTATION CONTRACTOR				
					bushing (SF6/Cable/Air) and bushing of reactors (Air).				
		4.	LV Auxiliary power and control cables (External to the reactors and their local control cabinet)	Provide all LV Auxiliary power and control cables to be installed between Reactor accessories and local control cabinet/OLTC MDU.	Provide, install, splice, terminate, test and commission all LV Auxiliary power and control cables to be installed between Reactor local control cabinet and substation control room including all required materials.				
		5.	Surge Arresters	Provide (360kV) outdoor, station class, metal-oxide Surge Arresters. Provide mounting brackets of the surge arresters adjacent to the outdoor air bushings.	Install onto brackets of reactors, terminate, test and commission surge arresters.				
		6.	Reactor Tank Grounding	Provide the provision for reactor tank grounding.	Provide, terminate, test and commission grounding cables at two point of the reactor tank as per clause 12.1 of TES-P-119.10.				
		7.	Online Gas Analyzer	Provide Online Gas Analyzer as per 53-MSS-03	Integrate online DGA with SAS including Fiber optic cables				
		8.	Neutral Grounding Resistor (as Applicable)	Cable Tray/Support on the Reactor shall be provided for the cable connecting the NGR with LVN Bushing.	Provide, install, test, commission and terminate the neutral grounding resistors (NGRs) to the Reactor LVN Bushing. The connecting cable shall be 1C x 185 mm2.				
		9.	Neutral Grounding Reactors (as Applicable)	Cable Tray/Support on the Reactor shall be provided for the cable connecting the NGR with LVN Bushing.	Provide, install, test, commission and terminate Neutral Grounding Reactors with bushing CTs, neutral grounding connections, surge arresters, supporting structures, cable compartment and grounding cables. The NGR design/sizing calculations shall be submitted for SEC review and approval. Substation contractor shall provide install, test, commission and terminate all required				
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APPROVED BY GROUP LEADER  KHALIL I. AL-HANOUN DATE : 15 / 08 / 2024																											
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	SECTION 3 BASIC REQUIREMENTS AND GUIDELINES					
	3.1 GENERAL CONDITIONS					
	A. All components and accessories required for the completion and successful operation of the WORK covered under the scope of this PURCHASE CONTRACT, either specified in detail or not, shall be supplied by the MANUFACTURER as necessary.					
	B. The engineering design and specification of equipment/materials supplied under this PURCHASE CONTRACT shall be in accordance with this scope of work, technical specifications and COMPANY standards.					
	C. The drawings enclosed with this scope of work and technical specifications are conceptual and for the information of MANUFACTURER only. The MANUFACTURER should read these drawings in conjunction with this scope of work and technical specifications. The successful MANUFACTURER shall develop detailed design drawings for construction purposes.					
	D. The specifications of EQUIPMENT specified herein are to be considered as the minimum requirements, and the MANUFACTURER shall carry out his own EQUIPMENT basic and detailed design necessary for his proposed specifications.					
	E. All documents, drawings, data and instruction books to be submitted by the MANUFACTURER shall be written in English language and Metric unit system.					
	F. COMPANY'S acceptance of the MANUFACTURER'S design does not relieve him of any part of his obligations to meet all the requirements of this PURCHASE CONTRACT nor the responsibility for the correctness of the design drawings of EQUIPMENT to the related PROJECT(S).					
	G. MANUFACTURER shall have a local office in Saudi Arabia as full authorized representative for managing, coordinating activities, close communication, handling and supervising this PURCHASE CONTRACT.					
H. MANUFACTURER shall provide complete address of his office in Saudi Arabia and full contact information. All correspondence and notices will be made at the provided MANUFACTURER office address in Saudi Arabia. Any change in address or key personnel, COMPANY shall be notified promptly.						
I. MANUFACTURER shall provide full details for his Saudi Bank Account in order to facilitate payments for the purchase orders.						
3.2 PURCHASE CONTRACT KICK-OFF MEETING						
A Kick-Off meeting will be held in COMPANY Headquarters shortly after the award of this PURCHASE CONTRACT. This meeting will cover EQUIPMENT design stage, scope						
NO. 1 2 3						
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DEPARTMENT ENGINEERING & DESIGN						
PREPARED BY Project Engineers KUMAIL N. ALFASHKHI DATE: 15 / 08 / 2024						
APPROVED BY GROUP LEADER KHALIL I. AL-HANOUN DATE: 15 / 08 / 2024						
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	of work, schedule and will give MANUFACTURER an opportunity to discuss all matters related to carrying out his responsibilities and interface points.					
	3.3 EQUIPMENT DESIGN PHASE					
	A. GENERAL					
	The EQUIPMENT design stage for this PURCHASE CONTRACT is an 8-10 week period from the kick-off meeting. The purpose of the EQUIPMENT design stage is to completely define the EQUIPMENT in enough details to ensure the COMPANY that all requirements are being met. Information developed during the EQUIPMENT design shall be used as a guide throughout the PROJECT(S) and shall be considered binding on both parties, unless operational difficulties or design flaws observed during detailed design review are noted and mandate change. MANUFACTURER is responsible to provide any design/data required in the scope of work and technical specifications of PROJECT(S).					
	B. PRELIMINARY DESIGN PACKAGE(S)					
	The MANUFACTURER shall submit, for each EQUIPMENT type, two (2) sets of EQUIPMENT preliminary design documents (Hard and soft copy) within four (4) week period after the PURCHASE CONTRACT kick-off meeting.					
	The EQUIPMENT design submittal shall be submitted fully complete. Partial submittals of package(s) are unacceptable and will be rejected. Additional drawings, if provided, will not be reviewed during the EQUIPMENT preliminary design stage.					
	C. FINAL DETAIL DESIGN PACKAGE(S)					
	The MANUFACTURER shall submit, for each EQUIPMENT type, two (2) sets of EQUIPMENT detail design documents (Hard and soft copy) within four (4) week period after finalizing the EQUIPMENT preliminary design.					
The EQUIPMENT detail design package(s) shall be submitted fully complete. Partial submittals of package(s) are unacceptable and will be rejected.						
D. MANUFACTURER DRAWINGS						
1. All MANUFACTURER drawings shall be subject to review and approval by the COMPANY at various stages (Bid/EQUIPMENT preliminary design/EQUIPMENT final detail design/PROJECT(S) base design/PROJECT(S) final detail design/As-Manufactured/Final As-Manufactured/As-Built).						
2. The MANUFACTURER shall submit typical samples for drawings in Flash Memory/internet cloud link along with EQUIPMENT design package(s) for COMPANY review and check of drawings' conformance to the requirements of the COMPANY engineering drawing preparation standards (SEEDS-II).						
NO.	1	2	3			
REVISIONS						
DEPARTMENT ENGINEERING & DESIGN						
PREPARED BY Project Engineers						
						
KUMAIL N. ALFASHKHI						
DATE: 15 / 08 / 2024						
APPROVED BY GROUP LEADER						
						
KHALIL I. AL-HANOUN						
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DESCRIPTION

no.

REVISIONS

DEPARTMENT
ENGINEERING & DESIGN

PREPARED BY
Project Engineers

KUMAIL N. ALFASHKHI

DATE: 15 / 08 / 2024

APPROVED BY
GROUP LEADER

KHALIL I. AL-HANOUN

DATE: 15 / 08 / 2024

CERTIFIED BY
E&DD-EOA DIVISION
MANAGER (A)

AMEEN H. AL-HULAIMI

DATE: 15 / 08 / 2024

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CONSTRUCTION OR FOR
ORDERING MATERIALS
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DATED

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3. The drawings shall be assigned with drawing numbers and indexed as per COMPANY requirements. A block of drawing numbers shall be provided by the COMPANY for all new drawings/documents at various stages (Bid/EQUIPMENT preliminary design/EQUIPMENT final detail design/PROJECT(S) preliminary design/PROJECT(S) final detail design/As-Manufactured/Final As-Manufactured/As-Built).

4. MANUFACTURER drawings are design drawings, data schedules, specification sheets, installation, operating instructions and any other data required for EQUIPMENT installation. Such information is an integral part of the purchase order and shall be specified by the MANUFACTURER.

Note: All MANUFACTURER drawings shall be consistent with main drawings in all respects and the MANUFACTURER drawings shall clearly indicate all inter references with main drawings and all other MANUFACTURER drawings, as applicable.

3.4 EQUIPMENT PRELIMINARY REVIEW

MANUFACTURER shall present the EQUIPMENT preliminary design package(s) for technical review along with the drawing control sheet. MANUFACTURER'S representative(s) in each field of specification shall attend the presentation meeting. During this meeting, the COMPANY'S comments on the EQUIPMENT design package(s) will be reviewed and discussed in detail to finalize the EQUIPMENT design.

Minutes of the meeting shall be prepared by the MANUFACTURER and concurred by the COMPANY representative(s).

3.5 EQUIPMENT FINAL DETAIL DESIGN REVIEW

MANUFACTURER shall present the EQUIPMENT final design package(s) for technical review along with the drawing control sheet. MANUFACTURER'S representative(s) in each field of specification shall attend the presentation meeting. During this meeting, the COMPANY'S comments on the EQUIPMENT final design package(s) will be reviewed and discussed in detail to finalize the EQUIPMENT detail design.

Minutes of the meeting shall be prepared by the MANUFACTURER and concurred by the COMPANY representative(s).

3.6 EQUIPMENT FINAL DETAIL DESIGN CERTIFICATION

MANUFACTURER shall submit point wise compliance statement to COMPANY'S comments and obtain approval for all final detail design package(s) after incorporating COMPANY comments.

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	3.7 PROJECT(S) BASE DESIGN PHASE							
	The MANUFACTURER shall submit three (3) sets of the PROJECT(S) base design documents (Hard and soft copy) within four (4) weeks period after the PROJECT(S) kick-off meeting.							
	3.8 PROJECT(S) BASE DESIGN REVIEW							
	MANUFACTURER'S representative(s) in each field of specification shall attend the presentation meeting. During this meeting, the COMPANY'S comments on the base design package(s) will be reviewed and discussed in detail to finalize the base design for the PROJECT(S) and EQUIPMENT design of related PROJECT(S).							
	Minutes of the meeting will be prepared by the SUBSTATION CONTRACTOR and concurred by COMPANY and MANUFACTURER representative(s).							
	3.9 AS-MANUFACTURED DRAWINGS							
	MANUFACTURER shall furnish two (2) complete set of all drawings (Hard and soft copy) to COMPANY stamped as "As-Manufactured", two (2) weeks before EQUIPMENT factory acceptance test. Drawings shall have the P.O. number and Power Transformer ID (as per clause 4.02) on each sheet for the designated projects.							
	3.10 QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS							
	A. <u>Quality Management</u>							
MANUFACTURER shall implement an effective quality management which addresses all direct and indirect activities related to this PURCHASE CONTRACT to ensure that all contractual conditions are met. Quality planning, quality control, quality assurance and quality improvement shall be part of MANUFACTURER's quality management. To effectively manage the EQUIPMENT quality, MANUFACTURER shall develop a clearly defined EQUIPMENT Quality Plan/Quality Program. The EQUIPMENT Quality Plan/Quality Program shall be implemented through all stages during manufacturing process starting from procurement, reception of raw material, manufacturing/fabrication and until EQUIPMENT delivery. In addition, MANUFACTURER is also required to develop and implement quality control/Inspection and testing plan for EQUIPMENT as per Section 3.10.C.								
B. <u>EQUIPMENT Quality Plan/Quality Program</u>								
1. The EQUIPMENT Quality Plan/Quality Program shall set out the specific quality procedures and practices, resources, and all activities (in sequence) relevant to this PURCHASE CONTRACT. The EQUIPMENT Quality Plan/Quality Program shall								
NO.	1	2	3					
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PREPARED BY Project Engineers								
								
KUMAIL N. ALFASHKHI								
DATE: 15 / 08 / 2024								
APPROVED BY GROUP LEADER								
								
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DESCRIPTION	address QA/QC activities during design, procurement, manufacturing/fabrication, storage, delivery, installation, testing and commissioning of all items of WORK and EQUIPMENT.									
	2. The EQUIPMENT Quality Plan/Quality Program shall be submitted to the COMPANY as part of the EQUIPMENT design package for review and approval.									
	3. The EQUIPMENT Quality Plan/Quality Program shall clearly define and address the following:									
	a. <u>Procurement Control</u>									
	MANUFACTURER's QA/QC engineers shall review all products and services prior to procurement to ensure conformance to specified requirements. Procurement control shall include source evaluation and selection, source inspection and evaluation of objective evidence of quality furnished by the MANUFACTURER against the EQUIPMENT specification.									
NO.	1	2	3	b. <u>Quality Audit</u>			MANUFACTURER shall conduct its own internal quality surveillance at appropriate stages (e.g. design, procurement, storage, installation and commissioning stage) of the EQUIPMENT to determine compliance to and the effectiveness of the EQUIPMENT Quality Plan/Quality Program. Each element of the EQUIPMENT Quality Plan/Quality Program shall be assessed at least three (3) times during PURCHASE CONTRACT. The schedule and frequency should be adjusted if one or more of the following conditions exist:			
REVISIONS				i. Result of previous surveillance indicates a need to perform them more frequently.						
DEPARTMENT ENGINEERING & DESIGN				ii. Significant changes are made in the EQUIPMENT Quality Plan/Quality Program.						
PREPARED BY Project Engineers KUMAIL N. ALFASHKHI DATE: 15 / 08 / 2024				iii. Safety, performance or reliability of an item is questionable due to non-conformance.						
APPROVED BY GROUP LEADER KHALIL I. AL-HANOUN DATE: 15 / 08 / 2024				iv. Verification of corrective action implementation.						
CERTIFIED BY E&DD-EOA DIVISION MANAGER (A) AMEEN H. AL-HULAIMI DATE: 15 / 08 / 2024				Personnel conducting the quality surveillance shall be independent of those having direct responsibility for the specific activities or areas being evaluated or assessed.						
THIS DOCUMENT IS NOT TO BE USED FOR CONSTRUCTION OR FOR ORDERING MATERIALS UNTIL CERTIFIED AND DATED				c. <u>Non-Conformance Control</u>						
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	<p>MANUFACTURER shall ensure that items and services which do not conform to specified requirement are controlled in accordance with documented procedures to prevent unintended use. MANUFACTURER shall identify, document, segregate, evaluate and dispose non-conforming items and services after proper notification of concerned personnel within the MANUFACTURER'S organization.</p> <p>MANUFACTURER'S QA/QC engineer/inspector shall re-inspect repaired and reworked non-conforming items. MANUFACTURER shall not use any repaired item or product unless approved by the COMPANY.</p> <p>Under this clause, the following definitions apply:</p> <p>i. Repair - Action taken on a non-conforming product so that it will fulfill the intended usage requirements although it may not conform to the original specified requirements (ISO 9000:2015).</p> <p>ii. Rework - Action taken on a non-conforming product so that it will fulfill the specified requirement (ISO 9000:2015).</p> <p>MANUFACTURER'S QA/QC engineers/inspectors shall have the freedom to issue NCRs, verify implementation of corrective actions and prevent use of non-conforming items until the deficiency has been satisfactorily resolved.</p> <p>d. <u>Corrective Action</u></p> <p>MANUFACTURER shall develop, document and implement a system for determining the root cause of non-conformities and identifying the required corrective actions. New procedures or changes to existing procedures resulting from identification of the root cause and potential root cause of non-conformances shall be documented and implemented. Follow-up action shall be taken to verify effective implementation of corrective action.</p> <p>e. <u>Quality Records</u></p> <p>MANUFACTURER shall develop and maintain a system for preparation, maintenance, protection and preservation of quality records. Documents such as inspection reports, field inspection checklist, factory test reports, laboratory test reports, witnessed test reports, inspection logbooks, equipment calibration records/certificates, drawings and specifications, approved submittals and non-conformance reports are part of these records.</p> <p>f. <u>Control of Inspection, Measuring and Testing Equipment</u></p>					
	NO.	1	2	3		
	REVISIONS					
	DEPARTMENT ENGINEERING & DESIGN					
	PREPARED BY Project Engineers  KUMAIL N. ALFASHKHI DATE: 15 / 08 / 2024					
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DESCRIPTION	<p>All measuring and testing equipment and devices which can affect the quality of construction shall be controlled and maintained. MANUFACTURER shall develop and implement a documented calibration control program indicating equipment calibration schedule and identifying those who are responsible for control of the EQUIPMENT. MANUFACTURER shall ensure that only properly identified and calibrated measuring and testing equipment are used. Equipment calibration certificates shall be presented to the COMPANY representative(s), prior to commencement of related jobs.</p>										
	<p>g. <u>Document Control</u></p> <p>MANUFACTURER shall develop and maintain a documented control program for the review, approval, revision and distribution of documents for the activities affecting quality. Responsible personnel for revision, issuance and approval of documents shall be identified. Control shall ensure that all pertinent and current issues of appropriate documents are available at locations where they are essential and obsolete or superseded documents are promptly removed. MANUFACTURER shall list all the documents that have to be controlled and shall include EQUIPMENT Quality Plan/Quality Program, quality control plan/inspection and test plan, drawings, calculations, correspondence, inspection and test reports, field inspection checklist, etc.</p>										
	<p>h. <u>Material/Equipment Handling, Storage, Identification and Control</u></p> <p>MANUFACTURER shall verify that EQUIPMENT meet prescribed contractual requirements and are properly handled, identifiable, traceable, cleaned, preserved and stored.</p>										
	<p>i. Control of interface and interaction between the COMPANY and QA/QC services CONTRACTOR [Independent Inspection Agency(ies)].</p> <p>j. Any other applicable QA/QC activity(ies) for the EQUIPMENT.</p>										
	<p>4. <u>Design Control</u></p> <p>a. All design input and output shall be reviewed prior to release to the next stage. In addition to design review, design verification shall be conducted to ensure that the design stage output meets the design stage input requirements.</p> <p>b. MANUFACTURER shall ensure that all design computations, design drawings and other design documents are properly controlled and checked prior to submission to the COMPANY. Design documents shall be signed by the person(s) who prepared and checked them. COMPANY reserves the</p>										
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DESCRIPTION	right to return design documents without the proper signature of the responsible person(s).									
	5. <u>Field Testing/Inspection and Construction/Installation Control</u>									
	MANUFACTURER shall establish and document all procedures and WORK instructions to ensure that the erection and installation processes are performed in a controlled manner.									
	MANUFACTURER shall conduct inspection and testing activities of EQUIPMENT at all phases and quality audit at appropriate stages of the PROJECT(S) construction/installation.									
	C. <u>Quality Control Plan/Inspection and Test Plan</u>									
1. The MANUFACTURER shall submit to the COMPANY the quality control plan/inspection and test plan for EQUIPMENT covered under purchase order(s).										
The quality activities including but not necessarily limited to, inspection and testing, for the EQUIPMENT shall be planned and documented in the form of a quality control plan/inspection and test plan. The quality control plan/inspection and test plan shall be submitted to the COMPANY together with the EQUIPMENT Quality Plan/Quality Program.										
2. The essential features of the required quality control plan/inspection and test plan are as follows:										
a. It is specifically identified to a particular material/equipment.										
b. It has provision for revisions to be made and is assigned a unique document number.										
c. It lists all the inspection and testing activities sequentially.										
d. It states the location at which the activity is to be carried out.										
e. It identifies the applicable standard, test procedure to be followed and the acceptance criteria for the inspection or test activity.										
f. It identifies the extent of inspection, sampling frequency and sample size, or extent of check.										
g. It identifies the hold point, witness point and surveillance point.										
h. It identifies the record document to be generated, reviewed and retained.										
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	<div>3. The quality control plan/inspection and test plan shall indicate the scheduled dates of testing and inspection at the designated location.</div> <div>4. The MANUFACTURER shall arrange traveling requirements of COMPANY Personnel for witnessing factory manufacturing process, inspection and testing of EQUIPMENT, as per the requirements of section 3.27. The MANUFACTURER shall submit a schedule for factory inspection of EQUIPMENT after issuing request for manufacturing for COMPANY review.</div> <div>5. Inspection and test plan is to be approved during EQUIPMENT preliminary design stage.</div> <div>D. <u>Other Suppliers</u></div> <div>MANUFACTURER shall ensure that purchase order(s) are not re-assigned or sub-contracted to other manufacturers/suppliers without COMPANY'S written consent.</div> <div>E. <u>Quality Assurance and Quality Control Services Contractor [Independent Inspection Agency]</u></div> <div>1. MANUFACTURER shall contract with COMPANY approved Quality Assurance and Quality Control Services CONTRACTOR(s) to provide Quality Control/Quality Assurance monitoring of all quality activities related to manufacturing of EQUIPMENT.</div> <div>2. MANUFACTURER shall instruct the contracted Quality Assurance and Quality Control Services CONTRACTOR(s) to provide directly to COMPANY REPRESENTATIVE, by express mail or fax, four (4) copies of material status, quality surveillance reports, inspection and test reports within seven (7) days after the inspection. Soft copy of these signed reports in CD shall also be furnished and submitted for COMPANY records. All pages of the inspection and test reports shall be reviewed, signed and stamped by the approved inspector from the Quality Assurance and Quality Control Services CONTRACTOR.</div> <div>3. MANUFACTURER'S Quality Assurance and Quality Control Services CONTRACTOR shall not re-assign or sublet portion of their contracted Quality Control/Quality Assurance monitoring WORK.</div> <div>4. MANUFACTURER shall provide the COMPANY a copy of the scope of work issued to the Quality Assurance and Quality Control Services CONTRACTOR.</div> <div>5. MANUFACTURER shall instruct the Quality Assurance and Quality Control Services CONTRACTOR to verify and check each material/equipment for conformance against the PROJECT(S) scope of work and technical specification and each clause of the applicable COMPANY Material Standard Specification (TMSS) and report all deviations that are not included in the COMPANY issued</div>					
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DESCRIPTION	clarifications. The report of the Quality Assurance and Quality Control Services CONTRACTOR shall include the following:														
	a. PROJECT title, CONTRACT number.														
	b. Complete description of the inspected material/equipment.														
	c. Report number and date.														
	d. Place and date of inspection, scope of inspection.														
e. Documents used during inspection.															
f. MANUFACTURER and plant location where the EQUIPMENT was manufactured.															
g. Detailed description of the inspection and testing activities and their results, deviations to specification, MANUFACTURER'S explanation to the deviations, visual inspection result, packing and marking inspection result, conclusion and copy of the outline drawing of the inspected material/equipment. Witnessed tests and reviewed test data shall be clearly identified in the inspection reports.															
h. Name and signature of the inspector(s).															
6. MANUFACTURER shall furnish copies of the following document to the Quality Assurance and Quality Control Services CONTRACTOR(s) contracted to perform Quality Assurance and Quality Control monitoring of each material and equipment before surveillance:															
a. Purchase order placed to the manufacturer/supplier.															
b. Relevant section of PROJECT(S) scope of work and technical specification.															
c. Applicable COMPANY developed standard and specification.															
d. MANUFACTURER'S technical specifications and COMPANY approved design drawings.															
e. COMPANY'S approval of material/equipment and applicable clarifications issued by the COMPANY.															
f. COMPANY approved test program, manufacturing quality control plan or inspection and test plan.															
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	<p>7. MANUFACTURER shall send to the COMPANY, copy(ies) of all technical correspondence exchanged between MANUFACTURER and "Quality Assurance and Quality Control Services CONTRACTOR".</p> <p>8. MANUFACTURER shall obtain approval from COMPANY before allowing any personnel of the Quality Assurance and Quality Control Services CONTRACTOR to perform Quality Assurance and Quality Control monitoring activities related to EQUIPMENT manufacturing. MANUFACTURER shall propose the names of the inspectors from the latest COMPANY Approval List. The specific material/equipment to be inspected, MANUFACTURER and location of manufacturing plant shall be identified for each proposed inspector of the Quality Assurance and Quality Control Services CONTRACTOR.</p> <p>9. COMPANY has the right to hire third party to monitor the process of manufacturing, the MANUFACTURER shall provide all required facilities in the factory to accommodate the third party in order to facilitate his task.</p> <p>F. COMPANY's Quality Assessment (Audit) Right</p> <p>1. COMPANY reserves the right to conduct scheduled and/or unscheduled quality assessment of MANUFACTURER's Quality System and EQUIPMENT Quality Plan implementation. The results of such assessments (audits) shall be confidential between MANUFACTURER and COMPANY.</p> <p>MANUFACTURER shall provide all access and assistance in a timely manner to COMPANY personnel who will perform the quality assessment (audit).</p> <p>The MANUFACTURER shall implement corrective actions on all deficient areas discovered during the quality assessment (audit) within a mutually agreeable time frame. All costs (except cost of wages, transportation and lodging of COMPANY Quality Assessors) incurred during the quality assessment (audit) shall be borne by the MANUFACTURER.</p> <p>2. COMPANY reserves the right to perform plant survey, quality assessment (audit), and quality surveillance activities and to inspect material at the MANUFACTURER'S facility to verify compliance with the terms and conditions of the purchase order(s) and its related documents. COMPANY reserves the right to witness any and all tests specified and to perform such visual examination (inspection) at the MANUFACTURER'S facility. COMPANY reserves the right to require certificates and data from the MANUFACTURER on any pertinent aspect of the manufacturing process, including but not limited to, mill test reports, heat treatment certificates, welders and welding procedure qualification records, non-destructive examination records, test records and quality control manual that will form part of the non-material requirement that shall be shipped to COMPANY as a document package.</p> <p>3.11 TEST RECORD BOOK</p>							
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	<p>The Quality Assurance and Quality Control Services Contractor shall send directly to the COMPANY a copy of "Test Record Book" for factory test report of EQUIPMENT.</p> <p>MANUFACTURER shall send to the COMPANY a copy of "Test Record Book" for factory test report of EQUIPMENT.</p> <p>3.12 FINAL AS-MANUFACTURED DRAWINGS</p> <p>MANUFACTURER shall furnish two (2) complete set of all drawings (Hard and soft copy) to COMPANY, stamped as "Final As-Manufactured" within two (2) weeks after Factory Acceptance Testing (FAT) for the designated PROJECT.</p> <p>The "Final As-Manufactured" Drawings shall incorporate all the comments raised during "Factory Acceptance Testing (FAT)" and in "As-Manufactured" drawings.</p> <p>3.13 EQUIPMENT AS-BUILT DRAWINGS</p> <p>MANUFACTURER shall coordinate with the COMPANY for final SITE marked drawings with SITE modifications. MANUFACTURER shall prepare "As-Built" drawings in sufficient details to present an accurate record for the COMPANY within two (2) weeks after the COMPANY has handover SITE marked drawings to the MANUFACTURER.</p> <p>3.14 Power Transformer Notification & PURCHASE ORDERS</p> <p>EQUIPMENT will be requested through "Power Transformer Notification" that will be initiated by COMPANY for specific PROJECT(S), for which terms and conditions stipulated in this PURCHASE CONTRACT shall apply.</p> <p>The "Power Transformer Notification" shall be considered accepted upon COMPANY receipt of the MANUFACTURER's acknowledgment. However, if no exceptions are recorded by MANUFACTURER within seven (7) days of the order receipt, total acceptance of the order is acknowledged by MANUFACTURER without reservation or exceptions, whether or not MANUFACTURER has signed and returned the acceptance copy.</p> <p>MANUFACTURER shall not commence the activities of the manufacturing of the ordered EQUIPMENT until the related "Purchase Order" has been issued by COMPANY.</p> <p>However, MANUFACTURER may proceed with procurement of basic components which are unlikely to change based on COMPANY comments on MANUFACTURER'S submittal.</p> <p>3.15 PROGRESS REPORTING</p>							
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DESCRIPTION	<p>A. The MANUFACTURER shall submit EQUIPMENT monthly progress reports, in COMPANY approved formats (hard and soft copy) to the responsible COMPANY representative. For this purpose, the total WORK shall be divided into:</p> <ul style="list-style-type: none">1. Engineering and Design.2. Procurement/Manufacture/Fabrication, inspection and delivery of EQUIPMENT.3. Supervision on EQUIPMENT installation.4. Supervision on EQUIPMENT testing and commissioning. <p>B. The following information shall be included in the progress reports:</p> <ul style="list-style-type: none">1. Percent of WORK completed as compared to the weighted schedule used to assess WORK progress.2. Problem areas which can have an adverse effect on the schedule.3. Supervisors and equipment availability against the schedule requirement. <p>C. The MANUFACTURER shall carry out planning/scheduling by using MS PROJECT computer software or other COMPANY approved software. All schedules shall be submitted in CD-ROM.</p> <p>D. As found necessary by COMPANY, coordination meeting(s) for EQUIPMENT progress will be conducted between COMPANY, MANUFACTURER and SUBSTATION CONTRACTOR during the duration of the PROJECT(S) contract. The SUBSTATION CONTRACTOR will prepare the minutes of all meetings. The initial draft will be submitted by the SUBSTATION CONTRACTOR to the COMPANY representative and the MANUFACTURER representative for review and concurrence. The SUBSTATION CONTRACTOR will then incorporate the required corrections and submit to the COMPANY one (1) original and three (3) copies after they are duly signed by the authorized representatives of the MANUFACTURER and SUBSTATION CONTRACTOR. The COMPANY shall sign two (2) copies in acceptance and furnish one (1) to the MANUFACTURER and one (1) to the SUBSTATION CONTRACTOR and retain the original.</p>							
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<p>3.16 PACKING</p> <p>Packing and shipping shall be in accordance with 01-TMSS-01.</p>								
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DESCRIPTION	3.17 RELEASE FOR SHIPMENT							
	<div>1. "Release for Shipment Certificate" is a certificate issued by the COMPANY to the MANUFACTURER to release the described EQUIPMENT for shipment after COMPANY approval of the EQUIPMENT factory test report.</div> <div>2. MANUFACTURER shall ensure that all material requiring inspection and/or quality surveillance at the MANUFACTURER'S facility are not shipped to the WORK SITE without a "Release for Shipment Certificate."</div> <div>3. MANUFACTURER acknowledges that material shipped without approved "Release for Shipment Certificate" is subject to rejection and return at the MANUFACTURER'S expense.</div> <div>4. MANUFACTURER shall ensure that all inspection and surveillance reports and any other requirements are satisfactorily completed before requesting the COMPANY to approve the "Release for Shipment Certificate."</div>							
	3.18 EQUIPMENT DELIVERY							
	<p>MANUFACTURER is responsible to arrange insurance, shipment, custom clearance, deliver and unloading the EQUIPMENT on the foundation at SUBSTATION SITE in Saudi Arabia. All cost at custom clearance, custom duties and fees of EQUIPMENT, to be borne by the MANUFACTURER.</p> <p>The delivery schedule of EQUIPMENT to the SUBSTATION SITE will be (8-10) months from the date of "Purchase Order".</p> <p>MANUFACTURER shall not ship the EQUIPMENT until "Release for Shipment Certificate" issued by COMPANY. This certificate will be considered as integral part of payment documents.</p> <p>MANUFACTURER shall coordinate with COMPANY/SUBSTATION CONTRACTOR for the delivery schedule.</p> <p>SUBSTATION CONTRACTOR will be responsible for construction of EQUIPMENT foundation at SUBSTATION SITE.</p> <p>SUBSTATION CONTRACTOR will be responsible for storing all the loose materials/panels/relays in a safe place inside or near substation.</p> <p>Due to reasons beyond COMPANY'S control, COMPANY can request MANUFACTURER to delay the shipment of EQUIPMENT by maximum three (3) months without any additional cost to COMPANY for shipment delay period and EQUIPMENT storage. In case, COMPANY requests to delay the shipment of EQUIPMENT more than three (3) months, a storage cost will be applicable to the COMPANY for extra delay days than the three (3) months.</p>							
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	<div>3.19 RECEIPT INSPECTION</div> <div>1. MANUFACTURER, SUBSTATION CONTRACTOR and COMPANY shall conduct receipt inspection of EQUIPMENT after delivery at PROJECT(S) SITE and during opening of EQUIPMENT packing. CONTRACTOR will repack the equipment under the supervision of the MANUFACTURER in case the EQUIPMENT foundation is not ready as per the committed schedule date.</div> <div>MANUFACTURER shall submit to COMPANY a document of EQUIPMENT Hand-Over to SUBSTATION CONTRACTOR. This document shall indicate PROJECT(S) information, purchase order reference, shipment certificate, time and date of handover and the status of EQUIPMENT packing with acknowledgement of SUBSTATION CONTRACTOR.</div> <div>2. SUBSTATION CONTRACTOR will promptly report to the COMPANY for any shipment and transportation damage.</div>																		
	<div>3.20 EQUIPMENT REPLENISH/REPLACEMENT</div> <div>In case the EQUIPMENT or part of the EQUIPMENT is lost or damaged or failure during transit and/or erection/testing, the following action to taken:</div>																		
	<table><thead><tr><th>Item</th><th>Event</th><th>Responsible</th><th>Action</th></tr></thead><tbody><tr><td>1.</td><td>Damage During Shipment of the EQUIPMENT up to SUBSTATION SITE. OR Part of EQUIPMENT is Lost.</td><td>MANUFACTURER</td><td><ul style="list-style-type: none">- SUBSTATION CONTRACTOR will notify COMPANY of damage occurrences and attaching the verification report for documenting the case.- MANUFACTURER shall replenish the same without affecting PROJECT Schedule at no extra cost to COMPANY.- If delay in PROJECT schedule happen due to lost or damage, a delay penalty to be applicable.</td></tr><tr><td>2.</td><td>Damage During Installation</td><td>SUBSTATION CONTRACTOR;</td><td><ul style="list-style-type: none">- SUBSTATION CONTRACTOR will notify COMPANY of damage occurrences and attaching the verification report for documenting the case.- SUBSTATION CONTRACTOR will coordinate directly with MANUFACTURER to replenish the</td></tr></tbody></table>								Item	Event	Responsible	Action	1.	Damage During Shipment of the EQUIPMENT up to SUBSTATION SITE. OR Part of EQUIPMENT is Lost.	MANUFACTURER	<ul style="list-style-type: none">- SUBSTATION CONTRACTOR will notify COMPANY of damage occurrences and attaching the verification report for documenting the case.- MANUFACTURER shall replenish the same without affecting PROJECT Schedule at no extra cost to COMPANY.- If delay in PROJECT schedule happen due to lost or damage, a delay penalty to be applicable.	2.	Damage During Installation	SUBSTATION CONTRACTOR;
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DESCRIPTION	<table><thead><tr><th>Item</th><th>Event</th><th>Responsible</th><th>Action</th></tr></thead><tbody><tr><td></td><td></td><td></td><td>same and Cost (to be paid by SUBSTATION CONTRACTOR) shall be mutually agreed upon. - MANUFACTURER shall replenish the same without affecting PROJECT(S) schedule.</td></tr><tr><td>3.</td><td>Failure of EQUIPMENT During TESTING & COMMISSIONING</td><td>MANUFACTURER</td><td>- SUBSTATION CONTRACTOR will notify COMPANY of failure occurrences and attaching the inspection report for documenting the case. - MANUFACTURER shall replenish the same without affecting PROJECT(S) schedule at no extra cost to COMPANY. - If delay in PROJECT(S) schedule happen due to lost or damage, a delay penalty to be entitled by COMPANY.</td></tr></tbody></table>						Item	Event	Responsible	Action				same and Cost (to be paid by SUBSTATION CONTRACTOR) shall be mutually agreed upon. - MANUFACTURER shall replenish the same without affecting PROJECT(S) schedule.	3.	Failure of EQUIPMENT During TESTING & COMMISSIONING	MANUFACTURER	- SUBSTATION CONTRACTOR will notify COMPANY of failure occurrences and attaching the inspection report for documenting the case. - MANUFACTURER shall replenish the same without affecting PROJECT(S) schedule at no extra cost to COMPANY. - If delay in PROJECT(S) schedule happen due to lost or damage, a delay penalty to be entitled by COMPANY.
	Item	Event	Responsible	Action														
				same and Cost (to be paid by SUBSTATION CONTRACTOR) shall be mutually agreed upon. - MANUFACTURER shall replenish the same without affecting PROJECT(S) schedule.														
	3.	Failure of EQUIPMENT During TESTING & COMMISSIONING	MANUFACTURER	- SUBSTATION CONTRACTOR will notify COMPANY of failure occurrences and attaching the inspection report for documenting the case. - MANUFACTURER shall replenish the same without affecting PROJECT(S) schedule at no extra cost to COMPANY. - If delay in PROJECT(S) schedule happen due to lost or damage, a delay penalty to be entitled by COMPANY.														
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REVISIONS																		
DEPARTMENT ENGINEERING & DESIGN																		
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3.21 TECHNICAL DATA MANUALS




The MANUFACTURER shall provide two (2) copies of EQUIPMENT technical data manuals installed for PROJECT(S).




The manuals binders shall have COMPANY logo, binder number and PROJECT(S) title, and CONTRACT number on the front cover.




3.22 COMMISSIONING, OPERATION AND MAINTENANCE MANUALS

- A. The MANUFACTURER shall submit to the COMPANY commissioning, operation and maintenance manuals, along with pre-commissioning and procedures manuals, consisting of, as a minimum, the following documents:
- Detailed MANUFACTURER'S instruction manuals applicable to each equipment installed. These manuals shall contain all information (including any special design and/or construction or operation feature) which may be required by the COMPANY for safe operation and maintenance of the new facilities and shall describe fully erection, commissioning, operation and maintenance procedures including mechanical/electrical tolerances for maintenance/repair purposes (Hard and soft copy).
 - MANUFACTURER'S instruction manuals applicable to each particular test apparatus (Hard and soft copy).

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DESCRIPTION	<div>3. Complete sets of exploded view drawings with comprehensive parts identification for each device to enable the COMPANY to catalogue and order.</div> <div>4. Interconnection and schematic diagrams.</div> <div>5. Setting and calibration procedures and instructions.</div> <div>6. Gasket Layout drawing showing the Size, Material and Location of each Gasket/O-ring.</div> <div>B. The submission schedule for commissioning, operation and maintenance manuals as detailed in (A) above shall be as given below:<div>1. Six (6) sets for preliminary review by COMPANY as to adequacy, completeness, and legibility at least eight (8) weeks before commencing commissioning tests.</div><div>2. Four (4) complete sets of fully revised manuals original (original hard and soft copy and no photocopies) incorporating the COMPANY'S comments to the full satisfaction of the COMPANY before technical completion of the PROJECT(S).</div></div>							
	NO.	1	2	3				
	REVISIONS							
	DEPARTMENT ENGINEERING & DESIGN							
<div>PREPARED BY Project Engineers</div> <div></div> <div>KUMAIL N. ALFASHKHI</div> <div>DATE: 15 / 08 / 2024</div>								
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<div>3.23 SPECIAL TOOLS/TEST EQUIPMENT</div> <div>MANUFACTURER shall provide and deliver to COMPANY designated warehouse new special tools/test equipment as ordered by COMPANY. However, general and SITE testing equipment for installation, testing and commissioning will be provided by SUBSTATION CONTRACTOR.</div> <div>MANUFACTURER shall arrange insurance coverage of all special tools/test equipment up to the WORK SITE to the final destination.</div> <div>All cost at custom clearance, custom duties and fees of special tools/test equipment to be borne by the MANUFACTURER.</div> <div>These special tools shall be supplied by MANUFACTURER, only after confirmation by COMPANY through written order(s) during duration of PURCHASE CONTRACT.</div> <div>Type/Model/Make of special tools indicated by the COMPANY/SUBSTATION CONTRACTOR is tentative only. Correct type/model/make against each item of shall be supplied, based on drawings approved by COMPANY.</div> <div>MANUFACTURER shall provide/use his own tools/test equipment's that are required for testing and commissioning the equipment at SITE. MANUFACTURER shall be responsible for the insurance of his tools.</div> <div>For More details, refer to Appendix-6.</div>								
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DESCRIPTION	<div>3.24 <u>START-UP SPARE PARTS</u></div> <p>MANUFACTURER shall deliver start-up spares along with EQUIPMENT complying with COMPANY specifications and standards. However, all components required for successful commissioning of the supplied EQUIPMENT due to failures/defects noticed shall be replaced by MANUFACTURER.</p> <p>MANUFACTURER shall submit technical data sheet as per latest COMPANY format for start-up covered under this PURCHASE CONTRACT for COMPANY approval before procurement. These details shall also be accompanied by catalogue cuts and drawings and/or extracts from O&M Manuals indicting details of each spare part.</p> <div>3.25 <u>OPERATIONAL SPARE PARTS</u></div> <p>MANUFACTURER shall provide and deliver to COMPANY designated warehouse(s) in Saudi Arabia operational spares complying with COMPANY specification as per schedule "C".</p> <p>MANUFACTURER shall arrange insurance coverage of all operational spare parts up to the final destination.</p> <p>All cost at custom clearance, custom duties and fees of operational spare parts to be borne by the MANUFACTURER.</p> <p>These operational spare parts shall be supplied by MANUFACTURER, only after confirmation by COMPANY through written order(s) during duration of PURCHASE CONTRACT.</p> <p>MANUFACTURER shall provide details of operational spare parts within sixty (60) days from the date of this PURCHASE CONTRACT in COMPANY prescribed format along with complete technical details/catalogue. This timely submittal is essential for COMPANY to confirm the requirement of spare parts as per the stipulated time.</p> <p>The parts data package shall include the following.</p> <ul style="list-style-type: none">All required data by COMPANY and cross references (Part No., Designation No., Drawing and Position No., Model No., Catalog No., Communication No., Product Code No., etc.) of spare parts of equipment and for each sub-assembly or auxiliary equipment that is identified by a unique model number or serial number.A complete bill of materials with appropriate drawings illustrating and identifying all parts/components in their respective positions on each item of equipment.						
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	<div>MANUFACTURER'S list of all interchangeable parts/components if any, between MANUFACTURER'S equipment.</div> <div>Type/Model/Make of spare parts indicated by COMPANY are tentative only. Correct type/model/make against each item of spare parts shall be supplied based on drawings approved by COMPANY. As per MANUFACTURER indicate that an item of spare parts is Not Applicable (N/A), MANUFACTURER shall be verified.</div> <div>For more detail, refer to Appendix-5.</div> <div>3.26 TRAVELING REQUIREMENTS<div>The Manufacturer shall provide round trip transportation/airfare, accommodations and food for the selected COMPANY personnel that will participate in the different activities as indicated on the relevant sections of this SOW/TS, based on the following minimum requirements:</div><div><div>i. For the airfare transportation requirements, Manufacturer shall provide IATA (International Air Transport Association) standard business class round-trip airfare tickets from international Airport in Saudi Arabia to the activity's locations.</div><div>ii. For the ground transportation requirements, to/from activities locations to hotels/airports/restaurants which participants will be utilizing as well as for ground transportation from participants homes locations to Airports, the Manufacturer shall provide ground transportation through use of established and reputable taxi/limousine services for these COMPANY personnel.</div><div>iii. For accommodations portion, Manufacturer shall provide accommodations for the COMPANY selected participants in either five stars, or four stars hotels if five-star hotels are not available in/near the city of the activities. Also, each COMPANY participant shall be provided with both breakfast and dinner ("buffet style") and unlimited Wi-Fi connection for the entire duration of hotel stay. Manufacturer shall provide a buffet style Halal lunch either at activities locations/facilities, or at a hotel/restaurant for each of the COMPANY participants for the entire duration stay.</div><div>iv. Manufacturer shall provide flight tickets and hotel reservation to the COMPANY personnel at least three (3) weeks before the scheduled flight for proper coordination.</div><div>v. International phone calls (within 20 minutes/day), internet/mobile Data (3GB/day), laundry services, water & juices shall be provided for COMPANY Personnel.</div><div>vi. Additionally, the Manufacturer shall be responsible for obtaining the necessary entrance VISA to the country (or countries) of the activities, locations and the Manufacturer shall pay the required entrance VISA, VISA application fees, and accommodation and transportation required to issue VISA for each COMPANY participant.</div></div><div>3.27 TECHNICAL ADVISORY SERVICES</div></div>					
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DESCRIPTION	<p>Installation, testing and commissioning work of EQUIPMENT shall be borne by SUBSTATION CONTRACTOR under direct MANUFACTURER supervision.</p> <p>MANUFACTURER shall provide complete SITE installation, testing and commissioning procedures for the EQUIPMENT supplied to SUBSTATION CONTRACTOR one (1) month before shipment as per COMPANY specifications/requirements.</p> <p>The duration of supervision of Installation, testing and commissioning as per COMPANY specifications and requirements is twenty-five (25) working Man-days for one (1) power transformer EQUIPMENT. In the supervision duration, involving numbers of trips of supervisors as required, cost of MANUFACTURER' supervisor(s) including air ticket to PROJECT SITE and back, VISA, insurance, food and accommodation, local transportation from Hotel to Job site and back shall be arranged and borne by MANUFACTURER.</p> <p>SUBSTATION CONTRACTOR will intimate and notify MANUFACTURER three (3) weeks in advance the supervision schedule and the required date of supervisor availability at PROJECT(S) SITE and MANUFACTURER shall arrange accordingly and obligate to this supervision schedule.</p> <p><u>WORKING HOURS:</u></p> <p>During the construction phase of the PROJECT, MANUFACTURER shall work during the normal working hours of the COMPANY, i.e. 7:00 AM to 3:00 PM unless otherwise instructed by the COMPANY. The MANUFACTURER shall coordinate with the COMPANY to get Access Permit to PROJECT(S) SITE before commencing the job. The MANUFACTURER shall coordinate with the SUBSTATION CONTRACTOR for performing supervision work.</p> <p>3.28 TRAINING REQUIREMENTS</p> <p><u>FACTORY TRAINING:</u></p> <p>MANUFACTURER shall submit training program for COMPANY review and approval.</p> <p>MANUFACTURER shall arrange factory training complete with all required instructional materials complying with COMPANY requirements as per Appendix-III.</p> <p>Training session(s) shall be arranged by MANUFACTURER, only after confirmation by COMPANY through a written notice during PURCHASE CONTRACT duration.</p> <p>MANUFACTURER shall provide travelling requirements for COMPANY personnel as specified in section 3.26.</p> <p><u>SITE TRAINING:</u></p>							
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	SITE demonstration during installation, testing and commissioning shall be conducted by MANUFACTURER supervisor(s).								
	3.29 WARRANTY								
	a) The EQUIPMENT/MATERIALS to be supplied shall be fit for the purpose intended, free of defects in design, engineering, materials or workmanship and conform to the standards/specifications contained in this PURCHASE CONTRACT.								
	b) MANUFACTURER shall provide warranty certificate for the EQUIPMENT to be supplied against any defects arising out of faulty design/engineering, defects in material or workmanship/manufacturing for a period of eighteen (18) months from the date of delivery or twelve (12) months from EQUIPMENT technical completion, whichever comes first. In addition, warranty requirements specified in the pre-qualification conditions to be applied to related MANUFACTURER.								
	c) If at any time prior to or within the warranty period, COMPANY found the EQUIPMENT to be defective, MANUFACTURER shall repair or provide replacement of the same on priority to the full satisfaction of COMPANY without any cost added to COMPANY. Should MANUFACTURER refuse to undertake the corrective work, then COMPANY has the right to perform or have others perform some or all of the corrective work at MANUFACTURER'S expense.								
	d) If, pursuant to the above, MANUFACTURER/COMPANY performs any corrective work, the warranty set forth above shall apply to such corrective work and any materials or equipment provided by MANUFACTURER/COMPANY for a period of twelve (12) months from the actual date of preliminary acceptance of corrective work.								
	e) The warranty certificate from MANUFACTURER in original (in MANUFACTURER'S Original Letterhead) shall be furnished by MANUFACTURER after completion of delivery.								
	f) MANUFACTURER'S liability under this warranty does not extend to defects caused by vandalism, improper installation/operation/maintenance.								
	END OF SECTION 3								
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	SECTION 4 <u>SCOPE OF WORK</u>																																																																																																					
	4.1 <u>GENERAL</u>																																																																																																					
	The MANUFACTURER shall design, engineer, manufacture, factory test, supply and supervise installation, testing and commissioning of Auto Power Transformers EQUIPMENT complete with all accessories along with all associated work and services in a satisfactorily manner as specified in this scope of work and technical specifications, whether specifically mentioned/specified in detail or not shall be supplied as necessary.																																																																																																					
	4.2 <u>AUTO TRANSFORMER EQUIPMENT & FACILITIES</u>																																																																																																					
	A. <u>302.5/402.5/502.5MVA, AUTO POWER TRANSFORMERS</u>																																																																																																					
	Design, engineer, manufacture, factory test, supply and supervise installation, testing and commissioning of 302.5/402.5/502.5MVA, ONAN/ONAF1/ONAF2, 3-phase, 60 Hz., oil immersed Auto Power Transformers, as per applicable COMPANY standards, including OLTC, all bushings, bushing current transformers (metering, protection etc.), monitoring sensors/ devices and other accessories.																																																																																																					
	The power transformer shall be one of the following types as detailed below:																																																																																																					
	a) <u>380/132kV or 380/115kV Auto power Transformer:</u>																																																																																																					
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	Design, engineer, manufacture, factory test, supply and supervise installation, testing and commissioning of 80/100MVA, ONAN/ONAF, 3-phase, 60 Hz., oil immersed Power Transformers, as per applicable COMPANY standards, including OLTC, all bushings, bushing current transformers (metering, protection etc.), monitoring sensors/ devices and other accessories.																																																																																																														
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EOA			With reference to Principal Tap
WOA/ SOA			

- ii. Metal Oxide Surge Arrester (Class SH) with bracket mounted on tertiary windings. Voltage rating and protective level of arresters shall be as required by insulation coordination study and type of system grounding.
- iii. Tertiary winding surge arrester shall be provided and mounted inside the TV cable termination box.
- iv. Oil/XLPE connection for secondary side (132/115 & 110kV) shall be suitable for three (3) terminations/phase up to 1Cx2000mm² Cu/XLPE along with required cable enclosure.
- v. To connect Power Transformer to substation MV Switchgear, MV cable box shall be designed to Accommodate four (4) cable per phase up to 1Cx1000mm², Cu conductor, super clean XLPE for 100/80 MVA Power Transformers.
- vi. To connect Auto Power Transformer to substation MV Switchgear, tertiary windings/box shall be designed to Accommodate One (1) cable per phase 1x1Cx185mm², Cu conductor, super clean XLPE.
- vii. MV cable box/Tertiary cable box shall be designed to connect One (1) MV Fully Insulated Condenser Bus Bars per phase & Associated accessories:
- viii. Grounding of auto Power Transformer shall be as following: -

WINDING	GROUNDING	REMARKS
HV	Solidly	Common Neutral
LV	Solidly / NGR	Common Neutral
TV	Zig-Zag transformer	See note below

Tertiary Winding if Not Loaded: The Tertiary windings of the transformer will externally connected to the ground as per IEC recommendations.

Tertiary Winding if Loaded: Tertiary Winding shall be grounded through Zig-Zag transformer if loaded with Station Service Transformer.

Tertiary windings of the transformers (80/100MVA) will not be loaded and therefore one corner of the delta winding shall be externally connected to the ground as per IEC recommendations. Provision for this shall be provided by Transformer Manufacturer.

DESCRIPTION

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REVISIONS

DEPARTMENT
ENGINEERING & DESIGN


PREPARED BY
Project Engineers


KUMAIL N. ALFASHKHI
DATE: 15 / 08 / 2024

APPROVED BY
GROUP LEADER


KHALIL I. AL-HANOUN
DATE: 15 / 08 / 2024

CERTIFIED BY
E&DD-EOA DIVISION
MANAGER (A)


AMEEN H. AL-HULAIMI
DATE: 15 / 08 / 2024

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TO BE USED FOR
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UNTIL CERTIFIED AND
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DRAWING CONTROL SHEET

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With
reference to
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ii.

Metal Oxide Surge Arrester (Class SH) with bracket mounted on tertiary windings. Voltage rating and protective level of arresters shall be as required by insulation coordination study and type of system grounding.

iii.

Tertiary winding surge arrester shall be provided and mounted inside the TV cable termination box.

iv.

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v.

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vi.

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vii.

MV cable box/Tertiary cable box shall be designed to connect One (1) MV Fully Insulated Condenser Bus Bars per phase & Associated accessories:

viii.

Grounding of auto Power Transformer shall be as following: -

WINDING	GROUNDING	REMARKS
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TV	Zig-Zag transformer	See note below

Tertiary Winding if Not Loaded:

The Tertiary windings of the transformer will externally connected to the ground as per IEC recommendations.

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Tertiary Winding shall be grounded through Zig-Zag transformer if loaded with Station Service Transformer.

Tertiary windings of the transformers (80/100MVA) will not be loaded and therefore one corner of the delta winding shall be externally connected to the ground as per IEC recommendations. Provision for this shall be provided by Transformer Manufacturer.

FINAL SOW/TS FOR PURCHASE CONTRACT FOR
EHV TRANSFORMERS AND REACTORS

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	C. <u>General Requirements for All Auto Power Transformers/Power Transformers</u>							
	The following requirements shall be specifically complied with for Auto Power Transformers/Power Transformers.							
	a) <u>General</u>							
	The Auto Power Transformers/Power Transformers shall be equipped with Vacuum on Load Tap Changer (OLTC) located at the HV winding and suitable for operating with Remote Tap Changer Control Panel (RTCC) to be supplied by others. The step voltage for the taps shall be 1.25%.							
	The full capacity of Auto power transformers/Power Transformers shall be available at all positions of the tap. The OLTC and all other current carrying accessories shall be rated for 120% of the current corresponding to highest current tap.							
	OLTC shall be provided with an over-current blocking device to stop the motor-drive mechanism of the On-Load Tap Changer from operating when the transformer load current exceeds a pre-set overload limit as specified in the clause 5.7.3 of IEC 60214.2.							
	380kV transformer OLTC shall be provided with varistors to avoid resonance with system and this is mandatory. If any other mechanisms are provided to take care of resonance complete details shall be provided for review and approval.							
	b) The detail of the location of CT's for winding temperature indicators shall be furnished to the COMPANY for review and approval.							
	c) The Auto Power Transformers/Power Transformers oil in all respect shall be as per 54-TMSS-01.							
d) Auto Power Transformers with outdoor LV Bushings shall be provided with respective voltage of the transformer; as applicable outdoor, station class, metal-oxide Surge Arresters that to be mounted on the designated Auto Power Transformers brackets.								
e) Power Transformers with outdoor HV Bushings shall be provided with respective voltage of the transformer; as applicable outdoor, station class, metal-oxide Surge Arresters that to be mounted on the designated Auto Power Transformers brackets.								
f) During shipment, each Auto power transformer/Power Transformer tank shall be fitted with two (2) impact recorders, each one capable of measuring the impact in three (3) directions. Downloading of impact recorder Recordings shall be done at National Grid SA designated office. It shall be the MANUFACTURER's responsibility to provide necessary interface hardware/software for the same.								
NO.	1	2	3					
REVISIONS								
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PREPARED BY Project Engineers  KUMAIL N. ALFASHKHI DATE: 15 / 08 / 2024								
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				الشركة الوطنية لنقل الكهرباء		National Grid SA	
DESCRIPTION	<p>The type of impact recorder to be fixed on the Auto power transformers/Power Transformers tank while transporting per 5.2 of 53-TMSS-01 is subject to National Grid SA approval.</p> <p>In case of any defect/failure of impact recorder during transit, National Grid SA may ask the MANUFACTURER to give extended warranty period. Therefore, extra care shall be exercised for installing the correct impact recorder.</p> <p>MANUFACTURER shall submit catalogue copies of proposed impact recorder for National Grid SA review and approval.</p> <p>g) The optical fiber sensors for hot spot measurements of Auto power transformers/Power Transformers as per 4.6.3 of 53-TMSS-01 shall be provided and terminated in Auto power the transformers/Power Transformers LCC.</p> <p>h) As per clause 4.6.3.f of 53-TMSS-01, Fiber optic sensors shall be provided with monitoring system. The system shall be fully integrated with SAS at bay level using IEC 61850 and also at station level integration with the HMI for analyzing purposes. Monitoring system software shall be compatible with all SAS Software's. This monitoring system shall support PRP.</p> <p>i) All parts of Control Cabinet panels shall be accessible. Otherwise staircase ladder shall be provided.</p> <p>j) MANUFACTURER shall design the Auto Power Transformers/Power Transformers with wheel moving facilities which can be detached at SITE and used as SKID type base Auto Power Transformers based on SITE conditions.</p> <p>k) MANUFACTURER shall arrange to ship sufficient quantity of oil including wastage/contingency to avoid any delay in SITE activities.</p> <p>l) The cantilever strength of all the bushings shall be as per IEC 60137.</p> <p>i. For Auto power transformer(s)/Power Transformers to be installed in locations with elevation higher than 1000m up to 3000m (if applicable), the Auto power transformer(s)/ Power Transformers accessories (including bushing dimensions), shall be properly designed to meet the specific environment requirements.</p> <p>m) <u>Power Transformer Tests</u></p> <p>Type, Routine and special Test shall be carried out on the Auto Power Transformers/Power Transformers under this purchase contract as follow:</p> <p>i. Type Tests, as per 53-TMSS-01, shall be carried out only on one representative unit for each type of Auto Power Transformer/Power Transformer under this Purchase Contract.</p>						
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	<div><div>ii. Routine Tests, as per 53-TMSS-01, shall be carried out on all Auto Power Transformers/Power Transformers under this Purchase Contract.</div><div>iii. All Special Tests listed under clause 6.3.1 of 53-TMSS-01, shall be carried out on all Auto Power Transformers/Power Transformers under this Purchase Contract. All other special tests required per IEC/ANSI shall be carried out only on one representative Auto Power Transformer/Power Transformer unit for each type of Auto Power Transformer/Power Transformers under this Purchase Contract.</div></div>																																					
	<div>4.3 SHUNT REACTOR EQUIPMENT & FACILITIES</div>																																					
	<div>A. 380kV BUS SHUNT REACTORS</div> <div>Complete 380kV Bus Shunt Reactor(s), 150/120/100/80/60 MVAR shall be supplied, including all bushings, bushing current transformers, monitoring sensors/ devices and other accessories.</div>																																					
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DESCRIPTION	National Grid SA			الشركة الوطنية لنقل الكهرباء												
	<table><tr><td>4.</td><td>Frequency</td><td>60</td><td>Hz</td><td></td></tr><tr><td>5.</td><td>Neutral Grounding</td><td>Solidly/ Neutral Ground reactor (as applicable)</td><td></td><td>Oil/Air termination</td></tr></table>						4.	Frequency	60	Hz		5.	Neutral Grounding	Solidly/ Neutral Ground reactor (as applicable)		Oil/Air termination
	4.	Frequency	60	Hz												
	5.	Neutral Grounding	Solidly/ Neutral Ground reactor (as applicable)		Oil/Air termination											
	B. SHUNT REACTORS DESIGN CRITERIA															
	Shunt Reactors shall be design with following criteria															
	a) The CONTRACTOR shall conduct suitable studies to design. Reactors shall have non-linear windings with a minimum 'k factor' of 1.4 of magnetic flux linkage peak value (p.u).confirming to COMPANY & relevant IEC/IEEE Standards															
	b) The bushing of the Shunt Reactors shall be designed for a higher BIL rating. CONTRACTOR shall provide calculation to prove the adequacy of the BIL rating.															
	c) Substation Contractor shall carry out the OVER VOLTAGE studies as defined in insulation coordination study requirements. Manufacturer shall coordinate with contractor for this study to ensure that reactor design is in line with the results.															
	d) Reactor manufacturer shall check that equipment must not fail due to high frequency (0.2 MHz – 2 MHz), resonance, ferro-resonance etc															
e) Oil/XLPE connection for shunt reactor shall be suitable for One (1) terminations/phase up to 1Cx1200mm2 Cu/XLPE along with required cable box.																
f) All parts of Control Cabinet panels shall be accessible. Otherwise staircase ladder shall be provided.																
g) MANUFACTURER shall coordinate with CONTRACTOR for above mentioned design/studies.																
4.4 PROTECTION REQUIREMENTS																
Refer to Appendix-3.																
4.5 CONTRACT DESIGN DOCUMENTS, CALCULATIONS AND DRAWINGS																
The MANUFACTURER shall submit all design documents, calculations, studies and drawings at various stages of the CONTRACT as per Table 4.01 below , as a minimum:																
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				الشركة الوطنية لنقل الكهرباء											
				National Grid SA											
				Table 4.01											
DESCRIPTION	NO.	1	2	3	SECTIONS	S/N	Documents	TRANSFORMER PURCHASE CONTRACT			DURING CONSTRUCTION STAGE				
								A. COMPLIANCE STATEMENT	B. DATA SCHEDULE	C. CALCULATIONS & TECHNICAL DATA	Bid Stage	Preliminary Design	Final Design	As Manufactured Stage	As Built Stage
REVISIONS															
DEPARTMENT ENGINEERING & DESIGN															
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				National Grid SA											
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											As Manufactured Stage	As Built Stage			
													Bid Stage	Preliminary Design	Final Design
	C.9	Cooling System Details and Calculations		X	X	X									
	C.10	Transformer/Reactor Grounding Details		X	X	X									
	C.11	AC/DC Load requirements for Transformer/Reactors and accessories		X	X	X									
	C.12	Technical details for Impact Recorder.		X		X									
D. DRAWINGS & CATALOGS		D.1	Drawing Control Sheet		X	X	X	X							
		D.2	Abbreviation, Symbols & Legend		X	X	X	X							
		D.3	Detail Transformer/Reactor & Accessories Outline Drawings		X	X	X	X							
		D.4	Rating Plate drawing with Protection & Metering CTs details.		X	X	X	X							
		D.5	AC/DC Power & control schematic diagram for Transformer and Accessories/Reactors.		X	X	X	X							
		D.6	Foundation Detail for Transformer/Reactors		X	X	X								
		D.7	Shipping Drawing		X	X	X								
		D.8	Detail Valve Location Plate		X	X	X								
		D.9	OLTC Catalogue		X	X									
		D.10	Accessory Catalogues		X	X									
E. Test Plan & Procedure		E.1	QA/QC Plan	X	X										
		E.2	Type Tests Report for Transformer/Reactors & OLTC	X	X										
DRAWING CONTROL SHEET				FINAL SOW/TS FOR PURCHASE CONTRACT FOR EHV TRANSFORMERS AND REACTORS				PLANT NO.	INDEX	DOCUMENT NO.	PAGE NO.	REV.			
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<p>Notes for the Above Table:</p> <ol style="list-style-type: none">Drawing control sheets shall be provided at every stage.All design documents/calculations shall be provided in PDF format, along with the other requirements mentioned in PTS SOW/TS, at every stage.All Drawings shall be provided in Microstation and PDF formats, along with the other requirements mentioned in PTS SOW/TS, at every stage.All calculations, studies, reports, drawings/sheets, MANUFACTURER/Vendor drawings/sheets shall be given standard National Grid SA drawing numbers and format in accordance with SEEDS-II and the same shall be included in the drawing control sheet as part of Project drawings/calculations."As-Manufactured" and "As-Noted" drawings shall be submitted to SUBSTATION CONTRACTOR for incorporating field changes.As-built drawings shall incorporate all the field changes (SUBSTATION CONTRACTOR will provide the mark up for field changes).As built drawings are required as per "Engineering Drawing Standard" SEEDS-II.																																																																					
<p>4.6 STANDARDS, CODES AND SPECIFICATIONS</p> <p>All WORKS equipment and material covered by this document shall conform to the latest edition of the COMPANY'S Material Standard Specifications supplemented with latest applicable industry standards, codes and specifications. The latest edition of each standard and specification shall mean the latest edition specified hereunder.</p>																																																																					
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	<p>The CONTRACTOR shall strictly comply with the following standards, codes and specifications, and no deviation shall be accepted unless otherwise accepted by a written waiver from COMPANY. The CONTRACTOR may propose "equivalent" standards and specifications if such standards and specifications are equal to or better than those specified herein, and shall be subject to prior approval of the COMPANY.</p>																																																																
	<table><tr><th>#</th><th>Std/Sepec. No.</th><th>Title/Description</th></tr><tr><td>A.</td><td colspan="2"><u>Saudi Arabian Standards</u></td></tr><tr><td></td><td>SASO 39/1978</td><td>Mechanical Test of Welded Joints</td></tr><tr><td></td><td>SASO/SSA-53</td><td>Graphic Symbols</td></tr><tr><td>B.</td><td colspan="2"><u>COMPANY Materials Standard Specifications</u></td></tr><tr><td></td><td>01-TMSS-01</td><td>GENERAL REQUIREMENTS FOR ALL EQUIPMENT/MATERIALS</td></tr><tr><td></td><td>31-TMSS-06</td><td>TERMINAL BLOCKS</td></tr><tr><td></td><td>35-TMSS-01</td><td>SURGE ARRESTER</td></tr><tr><td></td><td>53-TMSS-01</td><td>POWER TRANSFORMERS RATED ABOVE 2.5 MVA</td></tr><tr><td></td><td>58-TMSS-01</td><td>OIL IMMERSED REACTOR, 33 KV THROUGH 380 KV</td></tr><tr><td></td><td>54-TMSS-01</td><td>MINERAL INSULATING OIL FOR ELECTRICAL APPARATUS</td></tr><tr><td></td><td colspan="2">Note: All blanks on the data schedules (given in Appendix-II), Inquiry Information (for TMSS) shall be properly filled-up by the MANUFACTURER (as required) without omission and shall be submitted as part of the MANUFACTURER technical proposal.</td></tr><tr><td>C.</td><td colspan="2"><u>COMPANY Engineering Standards</u></td></tr><tr><td></td><td>TES-H-107.01</td><td>Painting Standards</td></tr><tr><td></td><td>TES-H-107.02</td><td>Paint Color Codes and Standards</td></tr><tr><td></td><td>TES-P-119</td><td>Substation Design Standards</td></tr><tr><td></td><td>TES-W-109.01</td><td>General Welding Criteria</td></tr><tr><td></td><td>TES-S-101.01</td><td>Safety and Security Standards</td></tr><tr><td>D.</td><td colspan="2"><u>COMPANY Construction Standards</u></td></tr></table>								#	Std/Sepec. No.	Title/Description	A.	<u>Saudi Arabian Standards</u>			SASO 39/1978	Mechanical Test of Welded Joints		SASO/SSA-53	Graphic Symbols	B.	<u>COMPANY Materials Standard Specifications</u>			01-TMSS-01	GENERAL REQUIREMENTS FOR ALL EQUIPMENT/MATERIALS		31-TMSS-06	TERMINAL BLOCKS		35-TMSS-01	SURGE ARRESTER		53-TMSS-01	POWER TRANSFORMERS RATED ABOVE 2.5 MVA		58-TMSS-01	OIL IMMERSED REACTOR, 33 KV THROUGH 380 KV		54-TMSS-01	MINERAL INSULATING OIL FOR ELECTRICAL APPARATUS		Note: All blanks on the data schedules (given in Appendix-II), Inquiry Information (for TMSS) shall be properly filled-up by the MANUFACTURER (as required) without omission and shall be submitted as part of the MANUFACTURER technical proposal.		C.	<u>COMPANY Engineering Standards</u>			TES-H-107.01	Painting Standards		TES-H-107.02	Paint Color Codes and Standards		TES-P-119	Substation Design Standards		TES-W-109.01	General Welding Criteria		TES-S-101.01	Safety and Security Standards	D.	<u>COMPANY Construction Standards</u>	
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	SECTION 5 <u>DESIGN CRITERIA</u>										
	The MANUFACTURER shall adopt the design criteria indicated below as a minimum for this purchase contract.										
	5.1 ENVIRONMENTAL CONDITIONS										
	All equipment, materials, devices and their specified ratings furnished under this PROJECT shall be suitable for operation as outlined in TES-P-119.02 and 01-TMSS-01.										
	5.2 ELECTRICAL DESIGN REQUIREMENTS										
	A. <u>General</u>										
	1. The system design parameters shall be in accordance with the requirements outlined in COMPANY Standard TES-P-119.02 and hereunder:										
	a. The short circuit rating of 132 kV or 115 kV or 110kV systems is 40kA for one (1) sec. (Sym.).										
	b. The short circuit rating of 380 kV systems is 63kA for one (1) sec. (Sym.).										
c. The short circuit rating of the 33kV system is 25kA for one (1) sec. (Sym.).											
d. The short circuit rating of the 13.8kV system is 25kA for one (1) sec. (Sym.).											
2. <u>Computer Calculations</u>											
If computer software is used in design calculations/studies, then the details regarding the name of the software, its version etc. shall be clearly indicated in the corresponding submittals and shall be accompanied by soft copy of the input and output files. Assumptions made (if any) shall be clearly highlighted with appropriate justification/supporting document for the assumed values. The data provided to the computer as an input shall be clearly distinguished from those computed by the program. A program description document (user's guide) and a copy of the software (on returnable basis) shall be made available upon request by the COMPANY and shall contain the information necessary to determine the nature and extent of the analysis, verify the input data, interpret the results, and determine whether or not the computations comply with these recommendations.											
B. <u>Auxiliary Supply Voltage</u>											
<table><tr><th>Description</th><th>Voltage</th></tr><tr><td>Supply Voltage for DC System</td><td>125V DC (Ungrounded)</td></tr><tr><td>Supply Voltage for Auxiliary Circuits</td><td>400/230V AC, 3Ø, 4 wire</td></tr></table>						Description	Voltage	Supply Voltage for DC System	125V DC (Ungrounded)	Supply Voltage for Auxiliary Circuits	400/230V AC, 3Ø, 4 wire
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	SECTION 6 <u>EQUIPMENT/MATERIALS & TECHNICAL SPECIFICATIONS</u>																										
	6.1 GENERAL																										
	This section outlines broadly the technical specifications of the major equipment/materials required for this CONTRACT. The specifications outlined herein shall be read in conjunction with the attached CONTRACT drawings, the COMPANY Material Standard Specifications and the associated international standards and codes. The ratings and specific requirements of the various electrical equipments shall be as indicated in data schedule of COMPANY Material Standard Specifications, and the MANUFACTURER shall ensure full conformity with the same.																										
	6.2 ELECTRICAL EQUIPMENT																										
	All equipment/materials shall conform to the related COMPANY standards and other standards in accordance with the tabulation hereunder (Table 6.01):																										
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	<table><tr><th>Serial No.</th><th>EQUIPMENT/MATERIAL</th><th>COMPANY Standards/ Other Standards</th></tr><tr><td>1.</td><td>380kV Auto Power Transformer /Power Transformer</td><td>53-TMSS-01</td></tr><tr><td>2.</td><td>380kV Bus Shunt Reactor</td><td>58-TMSS-01</td></tr><tr><td>3.</td><td>380kV Line Reactor</td><td>58-TMSS-01</td></tr><tr><td>4.</td><td>Transformer & Reactor Oil</td><td>54-TMSS-01</td></tr><tr><td>5.</td><td>Terminal Blocks</td><td>31-TMSS-06</td></tr><tr><td>6.</td><td>Surge Arrester</td><td>35-TMSS-01</td></tr></table>						Serial No.	EQUIPMENT/MATERIAL	COMPANY Standards/ Other Standards	1.	380kV Auto Power Transformer /Power Transformer	53-TMSS-01	2.	380kV Bus Shunt Reactor	58-TMSS-01	3.	380kV Line Reactor	58-TMSS-01	4.	Transformer & Reactor Oil	54-TMSS-01	5.	Terminal Blocks	31-TMSS-06	6.	Surge Arrester	35-TMSS-01
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Notes:																											
1. <u>Auto Power Transformers/Power Transformers</u>																											
a. Design Parameters																											
i. Auto Power Transformers/Power Transformers shall conform to the additional requirements per attached data schedules.																											
ii. The auto power transformers/Power Transformers shall be equipped with an on-load tap changer (OLTC), which shall be derived by the remote tap changing controller (RTCC) through IED located in transformer bay control panel and all functions of tap changer control will be integrated with SAS. Moreover, contacts of oil gas/surge relay for OLTC, contact of pressure relief device (main tank & OLTC), contacts																											
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REVISIONS																											
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DESCRIPTION	National Grid SA			الشركة الوطنية لنقل الكهرباء					
	<p>of oil temperature indicator, winding temperature indicator, buchholz relay, oil level indicator (main tank & OLTC) and other Auto Power Transformers/Power transformers accessories shall be compatible with SAS (control IEDs, annunciation IEDs and Protection IEDs).</p> <p>iii. Alarms of Auto Power Transformers/Power Transformers mechanical protection, if any, will also be integrated with SAS.</p> <p>END OF SECTION 6</p>								
	NO.	1	2	3					
	REVISIONS								
DEPARTMENT ENGINEERING & DESIGN									
<p>PREPARED BY Project Engineers</p> <p></p> <p>KUMAIL N. ALFASHKHI</p> <p>DATE: 15 / 08 / 2024</p>									
<p>APPROVED BY GROUP LEADER</p> <p></p> <p>KHALIL I. AL-HANOUN</p> <p>DATE : 15 / 08 / 2024</p>									
<p>CERTIFIED BY E&DD-EOA DIVISION MANAGER (A)</p> <p></p> <p>AMEEN H. AL-HULAIMI</p> <p>DATE: 15 / 08 / 2024</p>									
THIS DOCUMENT IS NOT TO BE USED FOR CONSTRUCTION OR FOR ORDERING MATERIALS UNTIL CERTIFIED AND DATED									
DRAWING CONTROL SHEET		FINAL SOW/TS FOR PURCHASE CONTRACT FOR EHV TRANSFORMERS AND REACTORS			PLANT NO.	INDEX	DOCUMENT NO.	PAGE NO.	REV.
CT-926673		SAUDI ARABIA			SE1057	A	PTS- 24CM335	61 OF 62	01

DESCRIPTION	National Grid SA			الشركة الوطنية لنقل الكهرباء		
	SECTION 7 <u>SUPERVISION OF EQUIPMENT INSTALLATION, SITE TESTING AND COMMISSIONING</u>					
	7.1 TRANSFORMER & REACTOR EQUIPMENT					
	A. MANUFACTURER shall provide complete site installation, testing and commissioning procedures for the Transformers to COMPANY/SUBSTATION CONTRACTOR in accordance with COMPANY testing and commissioning procedure (TCS-P-105). Site installation, testing and commissioning procedures for the Auto Auto Power Transformers shall be subject to COMPANY review and approval.					
	B. MANUFACTURER shall supervise EQUIPMENT installation, site testing and commissioning of Auto Power Transformers EQUIPMENT and related facilities.					
	C. The SUBSTATION CONTRACTOR will be responsible for providing temporary AC and DC power supplies needed to perform the commissioning and site tests. All tests shall be performed in accordance with the applicable IEC and ANSI Standards and established practices and procedures.					
	END OF SECTION 7 & SOW/TS					
	NO. 1 2 3					
	REVISIONS					
	DEPARTMENT ENGINEERING & DESIGN					
PREPARED BY Project Engineers  KUMAIL N. ALFASHKHI DATE: 15 / 08 / 2024						
APPROVED BY GROUP LEADER  KHALIL I. AL-HANOUN DATE : 15 / 08 / 2024						
CERTIFIED BY E&DD-EOA DIVISION MANAGER (A)  AMEEN H. AL-HULAIMI DATE: 15 / 08 / 2024						
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SAUDI ARABIA						
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APPENDICES

FOR SCOPE OF WORK & TECHNICAL SPECIFICATIONS

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APPENDIX-2	MATERIAL DATA SCHEDULES
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APPENDIX-4	TRAINING REQUIREMENTS
APPENDIX-5	OPERATIONAL SPARE PARTS REQUIREMENTS
APPENDIX-6	SPECIAL TOOLS & EQUIPMENT REQUIREMENTS

APPENDIX-1

DRAWING CONTROL SHEET & DRAWINGS

NOT APPLICABLE

APPENDIX-2

MATERIAL DATA SCHEDULES



6.0 DATA SCHEDULE

TERMINAL BLOCKS

SEC Enquiry No. _____ Date: _____

SEC Purchase Order No. _____ Date: _____
or Contract No. _____SEC PTS No./Project Title with J.O. No. Refer To Main SOW/TS

REFERENCE

SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4.0	<u>DESIGN AND CONSTRUCTION REQUIREMENTS</u>			
4.1	Terminal Block Make	*		
	Type/Model No.	*		
	Catalogue Enclosed	Yes		
	Comparative Tracking Index (CTI)	≥600		
	Creepage distance (mm)	*		
	Material group per IEC 60947-1	I		
	Insulation material	Polyamide 6		
	Pollution Degree	3 or above		

A'- SEC SPECIFIED DATA/PARAMETER.

'B'- BIDDER/SUPPLIER/VENDOR/CONTRACTOR PROPOSED DATA/PARAMETERS.

'C'- REMARKS SUPPORTING THE PROPOSED DEVIATION IN COLUMN 'B'.

(*)- DATA/PARAMETER TO BE PROVIDED/PROPOSED BY THE BIDDER/SUPPLIER/VENDOR/CONTRACTOR IN COLUMN 'B'.



6.0 DATA SCHEDULE

TERMINAL BLOCKS

REFERENCE SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4.3	Rated insulation voltage	*		
	Impulse withstand voltage	*		
	Rated current	*		
	Rated short time withstand current	*		
	Cross sectional area	*		
	Jumper bars size/rating	*		
	Sliding link rating	*		
	End section/stop size/rating	*		
4.5	Terminal Block Type	Screw/Spring loaded/Plug-in		
	CT Terminal Block –Disconnecting CT shorting terminal with ground link	*		
	VT Circuits Terminal Block	Sliding Link		
	Other types of Terminal Block	*		
	Tightening torque	*		
	Degree of protection	IP2x		
	Test sockets size/rating	*		
	Shot circuit plugs size/rating	*		
	Number of connections	1/2		
	Number of levels	1		
	Mounting on DIN rail acc. to IEC 60715	*		

6.0 DATA SCHEDULE

TERMINAL BLOCKS

A. ADDITIONAL TECHNICAL INFORMATION OR FEATURES TO BE FURNISHED BY SEC:

B. ADDITIONAL SUPPLEMENTARY DATA OR FEATURES PROPOSED BY BIDDER/VENDOR/SUPPLIER/CONTRACTOR:

B. OTHER PARTICULARS TO BE FILLED UP BY BIDDER/VENDOR/SUPPLIER/ CONTRACTOR:

	Actual Manufacturer of Equipment/Material	Vendor/Supplier/ Contractor
Name of the Company	_____	_____
Location and address	_____ _____ _____	_____ _____ _____
Name and Signature of authorized representative and date	_____ _____ _____	_____ _____ _____
Official Seal/Stamp of the Company & Date	_____	_____



6.0 DATA SCHEDULE

SURGE ARRESTER FROM 11kV THROUGH 380kV NOMINAL

National Grid SA Enquiry No. _____ Date: _____

National Grid SA Purchase Order No. or Contract No. _____ Date: _____

National Grid SA PTS No./Project Title with J.O. No. _____

REFERENCE
SECTION NO.

DESCRIPTION

'A'

'B'

'C'

SYSTEM DATA

Nominal System Voltage(kV)
(11kV, 13.8kV, 33kV, 34.5kV, 69kV,
110kV, 115kV, 132kV, 230kV or 380kV)

*

System Fault Current Level at
Rated System Voltage (kA)

*

Maximum Duration of Ground Fault (ms)

*

System Neutral Grounding at Arrester Point
Of Installation (Effectively, Non-Effectively
Grounded)

'A'- NATIONAL GRID SA SPECIFIED DATA/PARAMETER.

'B'- BIDDER/SUPPLIER/VENDOR/CONTRACTOR PROPOSED DATA/PARAMETERS.

'C'- REMARKS SUPPORTING THE PROPOSED DEVIATION IN COLUMN 'B'.

(*)- DATA/PARAMETER TO BE PROVIDED/PROPOSED BY THE BIDDER/SUPPLIER/
VENDOR/CONTRACTOR IN COLUMN 'B'.



6.0 DATA SCHEDULE

SURGE ARRESTER FROM 11kV THROUGH 380kV NOMINAL

REFERENCE SECTION NO.	DESCRIPTION	'A'	'B'	'C'
	System Component(s) to be protected			
	Transmission Line			
	Surge Impedance (ohms)	*		
	Length (kM)	*		
	Underground Cable			
	Capacitance (μ F/kM)	*		
	Length (kM)	*		
	Capacitor Banks			
	Capacitance (MVAR)			
	Others (Power Transformers, Reactors, GIS etc., attach details)	*		
3.0	<u>APPLICABLE INDUSTRY STANDARDS</u>	*		
4.0	<u>DESIGN AND CONSTRUCTION REQUIREMENTS</u>			
4.1	<u>General</u>			
	Type	*		
	Model Designation	*		
	Location (Indoor/Outdoor)			
4.2	<u>Performance Characteristics and Ratings</u>			
	Rated Voltage (U_r)			
	Continuous operating voltage (U_c)			
	Arrester Class/(LDC)	*		
	Dielectric Withstand for Housing			
	Lightning impulse withstand voltage, with 1.2/50 μ s waveform (kV_{peak})	*		
	Power frequency withstand voltage (Wet for Outdoor/Dry for indoor)	*		
	Switching impulse withstand voltage With 250/2500 μ s waveform (for arrester with rated voltage 200kV and above (kV_{peak}))	*		



6.0 DATA SCHEDULE

SURGE ARRESTER FROM 11kV THROUGH 380kV NOMINAL

REFERENCE SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4.2	Contd.			
	Nominal Discharge Current (Lightning Impulse Classifying Current) with 8/20 μ s waveform (kA)	*		
	High Current impulse Capability with 4/10 μ s Waveform (kA _{peak})	*		
	Maximum Lightning Impulse Residual Voltage With 8/20 μ s waveform (kV _{peak}) at a Discharge Classifying) current of:			
	- 5kA	*		
	- 10kA	*		
	- 20kA	*		
	- 40kA	*		
	Maximum Switching Surge Residual Voltage (kV _{peak}) at Discharge Current of			
	- 0.5kA	*		
	- 1kA	*		
	- 2kA	*		
	Maximum Steep Current /Front-of-Wave Residual Voltage Based on 1/ 2 or 0.5 μ s Waveform as Applicable (kV _{peak})			
	- 10kA	*		
	- 20kA	*		
	Temporary over voltage capability (kV _{rms}) (Manufacturer shall submit curve for TOV for the Following duration with and without Prior duty)			
	- 0.1second	*		
	- 1 second	*		
	- 10 second	*		
	100second	*		
	Maximum R.I.V (μ v)	*		



6.0 DATA SCHEDULE

SURGE ARRESTER FROM 11kV THROUGH 380kV NOMINAL

REFERENCE

SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4.2	Contd.			
	Maximum External Insulation Levels			
	Power Frequency Dry Withstand Voltage (kVrms) *			
	Power frequency wet withstand voltage (kVrms) *			
	Lightning impulse withstand voltage (kVpeak) *			
	Switching impulse withstand voltage (kVpeak) *			
	Leakage current through Arrester at COV (Uc) (mA) *			
	Maximum Energy Absorption Capability per Thermal Energy Rating (Wth) kJ/kV of arrester rated Voltage (U_r)			
	Repetitive Charge Transfer rating ($Q_{rs}(C)$)			
	Maximum resistive current acceptable *			
4.3	<u>Construction</u>			
	Pressure Relief Capability (rms symmetrical)			
	High Current Short duration			
	Low current, long duration (A)	600		
	Arrester Housing	Porcelain/Polymer		
	Color	*		
	Creepage Distance (mm)	*		
	Bending Failing Load (kN)	*		
	Cantilever Strength min (kN)	*		
	Torsional Strength (kN)	*		
	Compression Strength (kNm)	*		
	No. of Stacks in each unit	*		
	Height (mm)	*		



6.0 DATA SCHEDULE

SURGE ARRESTER FROM 11kV THROUGH 380kV NOMINAL

REFERENCE

SECTION NO.DESCRIPTION'A''B''C'

4.3 Contd.

Internal Pressure Required to Operate

Pressure relief device as a Percent of
Pressure required to Burst Porcelain (%)

*

Mounting arrangement

Mode of mounting (self-supporting/bracket

Bracket supporting)

*

Bolt circle diameter (mm)

*

No. of holes

*

Size of Bolts (mm)

*

Accessories

Scale range of leakage ammeter (mA)

*

Diameter of the grading ring if applicable (mm)

*

Material of grading ring if applicable

*

Terminals

Type

Pad

Size (mm)

*

Material (Al or CU)

*

Grounding

Size (mm)

*

Material

*

MISCELLANEOUSMinimum clearance between live parts
and earth parts (mm)

*

Minimum Permissible Center to Center
Distance between Arresters (mm)

*

Overall Height of arrester (mm)

*

Weight of arrester (kg)

*



6.0 DATA SCHEDULE

SURGE ARRESTER FROM 11kV THROUGH 380kV NOMINAL

- A. ADDITIONAL TECHNICAL INFORMATION OR FEATURES TO BE FURNISHED BY NATIONAL GRID,SA:
- B. ADDITIONAL SUPPLEMENTARY DATA OR FEATURES PROPOSED BY BIDDER/VENDOR/SUPPLIER/CONTRACTOR:
- C. OTHER PARTICULARS TO BE FILLED UP BY BIDDER/VENDOR/SUPPLIER/ CONTRACTOR:

	Actual Manufacturer of Equipment/Material	Vendor/Supplier/ Contractor
Name of the Company	_____	_____
Location and address	_____ _____ _____	_____ _____ _____
Name and Signature of authorized representative and date	_____ _____ _____	_____ _____ _____
Official Seal/Stamp of the Company & Date	_____	_____

7.0 DATA SCHEDULE

POWER TRANSFORMERS,
RATED ABOVE 2.5 MVANational Grid Saudi
Arabia Enquiry No. _____

Date: _____

National Grid, Saudi
Arabia, Purchase Order
No. or Contract No. _____

Date: _____

National Grid, Saudi Arabia PTS
No./Project Title with J.O. No. _____REFERENCE
SECTION NO.DESCRIPTION'A''B''C'

Power Transformer Model No./Type No.

*

Type of System Grounding(Solidly
grounded, resistance grounded, other)

HV

LV

TV (if applicable)

Common Neutral (Auto Transformer)

3.0 Applicable Industry Standards

*

4.0 DESIGN AND CONSTRUCTION REQUIREMENTS

4.1 Design Ambient Temperature (°C)

*

Number of Windings

Type of Cooling

Vector Group Designation

A'- SEC SPECIFIED DATA/PARAMETER.

'B'- BIDDER/SUPPLIER/VENDOR/CONTRACTOR PROPOSED DATA/PARAMETERS.

'C'- REMARKS SUPPORTING THE PROPOSED DEVIATION IN COLUMN 'B'.

(*)- DATA/PARAMETER TO BE PROVIDED/PROPOSED BY THE BIDDER/SUPPLIER/
VENDOR/CONTRACTOR IN COLUMN 'B'.



7.0 DATA SCHEDULE

POWER TRANSFORMERS,
RATED ABOVE 2.5 MVA

REFERENCE SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4.3.1	Natural Cooling Rating HV/LV/TV (MVA)	/ /	/ /	/ /
	1st Stage Forced Cooling HV/LV/TV (MVA)	/ /	/ /	/ /
	2nd Stage Forced Cooling HV/LV/TV (MVA)	/ /	/ /	/ /
	Rated Voltage Transformation Ratio HV/LV/TV (kV)	/ /	/ /	/ /
	Temperature Rise Based on Ambient Temperature Conditions Specified in 01- TMSS-01			
	Winding °C	*		
	Oil °C	*		
	Winding maximum (hot spot) Temperature (°C)	*		
	Design X/R ratio			
	HV	*		
	LV	*		
	TV	*		
	Impedance Voltage natural cooling power base and reference temp. of 75°C (%) (Manufacturer shall indicate the value with applicable tolerance)			
1.	At Principal Tap (Guaranteed values)			
	HV - LV			
	HV-TV (if applicable)	*		
	LV-TV (if applicable)	*		
2.	At Extreme Plus Tap			
	HV - LV	*		
	HV-TV (if applicable)	*		
	LV-TV (if applicable)	*		



7.0 DATA SCHEDULE

POWER TRANSFORMERS,
RATED ABOVE 2.5 MVA

REFERENCE

SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4.3.1 (continued)				
3.	At Extreme Minus Tap			
	HV - LV	*		
	HV-TV (if applicable)	*		
	LV-TV (if applicable)	*		
	Zero-sequence impedance on natural cooling power base and reference temp. of 75°C (%) (Manufacturer shall indicate the value with applicable tolerance)			
1.	At Principal Tap			
	HV - LV	*		
	HV-TV (if applicable)	*		
	LV-TV (if applicable)	*		
2.	At Extreme Plus Tap			
	HV - LV	*		
	HV-TV (if applicable)	*		
	LV-TV (if applicable)	*		
3.	At Extreme Minus Tap			
	HV - LV	*		
	HV-TV (if applicable)	*		
	LV-TV (if applicable)	*		
	Highest Design Operating Voltage for the tapings			
	continuous operation (%)	105		
	emergency operation (%)	110		
	Maximum Design Flux Density			
	at rated voltage (Tesla)	*		
	at 110% rated voltage (Tesla)	*		
	Saturation Voltage (% U_N)	*		
	Current density at rated output			
	Primary winding (Amp/mm ²)	*		
	Secondary winding (Amp/mm ²)	*		
	Tertiary winding (Amp/mm ²)	*		
	No-load current when excited from LV side as % of full load current	*		



7.0 DATA SCHEDULE

POWER TRANSFORMERS,
RATED ABOVE 2.5 MVA

REFERENCE

SECTION NO.

DESCRIPTION

'A'

'B'

'C'

4.3.1 (continued)

100% voltage (Guaranteed value)

*

105% voltage

*

110% voltage

*

No-load current harmonics

at 100% and 110% rated voltage (%)

2nd Harmonics

/

/

/

3rd Harmonics

/

/

/

4th Harmonics

/

/

/

5th Harmonics

/

/

/

6th Harmonics

/

/

/

7th Harmonics

/

/

/

8th Harmonics

/

/

/

9th Harmonics

/

/

/

Basic Impulse Withstand Voltage (BIL)

HV winding (kV_{peak})

*

LV winding (kV_{peak})

*

HV neutral end (kV_{peak})

*

LV neutral end (kV_{peak})

*

Common neutral for auto

transformer winding (kV_{peak})

*

Tertiary winding (kV_{peak})

*

Tertiary neutral end (kV_{peak})
(if applicable)

*

Switching Impulse Withstand Voltage
(BSL) if applicable (kV_{peak})

*

Separate Source Power Frequency
Withstand VoltageHV winding (kV_{rms})

*

LV winding (kV_{rms})

*

HV neutral end (kV_{rms})

*

LV neutral end (kV_{rms})

*

Common neutral for auto

transformer winding (kV_{rms})

*

Tertiary Winding (kV_{rms})

*



7.0 DATA SCHEDULE

POWER TRANSFORMERS,
RATED ABOVE 2.5 MVA

REFERENCE

SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4.3.1 (continued)				
	Tertiary neutral end (kV _{rms}) (if applicable)	*		
4.3.3	Requirement for parallel operation	Yes/No		
4.3.4	Guaranteed No-Load Losses at rated frequency (kW)			
-	at 100% rated voltage	*		
	No-Load Losses at rated frequency			
-	at 105% rated voltage	*		
-	at 110% rated voltage	*		
	Guaranteed Load Losses at 75°C at principal tapplings (kW) for Natural Cooling Rating (ONAN)			
-	HV to LV	*		
	Guaranteed Load Losses at 75°C at principal tapplings (kW) for Natural Cooling Rating (ONAN)			
-	LV to TV at TV rated power	*		
-	HV to TV at TV rated power	*		
	Guaranteed Load Losses at 75°C at principal tapplings (kW) for Stage 1 Cooling Rating			
-	HV to LV	*		
-	LV to TV at TV rated power	*		
-	HV to TV at TV rated power	*		
	Guaranteed Load Losses at 75°C at principal tapplings (kW) for Stage 2 Cooling Rating			
-	HV to LV	*		
-	LV to TV at TV rated power	*		
-	HV to TV at TV rated power	*		



7.0 DATA SCHEDULE

POWER TRANSFORMERS,
RATED ABOVE 2.5 MVA

REFERENCE

SECTIONNO.DESCRIPTION'A''B''C'

4.3.4 (continued)

Load Losses at 75°C at tappings having highest losses (kW)

- Tap Position No.
- HV to LV
- HV to TV

*

*

*

Total losses of auxiliaries, pumps and fans in service at full load (kW)

at Stage 1 cooling

at Stage 2 cooling

*

*

4.3.6 Maximum Symmetrical short circuit current for which windings are designed to thermally withstand

Duration (seconds)

HV winding (kA)

LV winding (kA)

TV winding (kA)

*

*

*

*

Maximum Asymmetrical short circuit current for which the windings are mechanically designed

HV winding (kA_{peak})

LV winding (kA_{peak})

TV winding (kA_{peak})

*

*

*

Thermal and mechanical damage curve per IEEE C57.109 enclosed

*

Yes/No

4.3.7 Temperature rise test to prove tertiary winding rating required

Yes/No

Transferred overvoltage calculation for tertiary winding enclosed

*

Yes/No



7.0 DATA SCHEDULE

POWER TRANSFORMERS,
RATED ABOVE 2.5 MVA

REFERENCE SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4.3.9	Noise level at rated voltage and frequency			
	- at Natural Cooling (dB)	*		
	- at Stage 1 Cooling (dB)	*		
	- at Stage 2 Cooling (dB)			
4.4	Construction			
4.4.1	Type of tank construction			
	Tank Cover	Welded		
	Min. thickness of tank steel (mm)			
	- Sides	*		
	- Base	*		
	- Cover	*		
	Min. Thickness of radiator plates (mm)	*		
	Maximum Positive Withstand Pressure of Tank and Radiators (kPa)	*		
	Minimum Vacuum Withstand (milli bar)	*		
4.4.3	Winding Insulation			
	HV Winding	*	Uniform/ Graded	
	LV Winding	*	Uniform/ Graded	
	TV Winding	Uniform		
	Winding Leakage Reactance (ohm)	*		
4.5	Tap Changer	On load		
	Manufacturer	*		
	Type	Oil/Vacuum		
	Type Designation	*		
	Tap Arrangement (Linear, Reversing or Coarse/fine)	*		
	Number of steps			
	Step Voltage (%)			
	Tapping Range (%)			
	Rated Through Current (A)	*		
	Short Circuit Current (kA)	*		



7.0 DATA SCHEDULE

POWER TRANSFORMERS,
RATED ABOVE 2.5 MVA

REFERENCE

SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4.5 (continued)				
	Dynamic short circuit current (kA_{peak})	*		
	Location (In-tank type fitted inside transformer main tank/outside transformer main tank or External mounted type)	*		
	Voltage Class (kV_{rms})	*		
	BIL (kV_{peak})	*		
	Type of transition impedance (high resistance)	*		
	Time of transfer from one step to another			
	- motor-operated (seconds)	*		
	- manually operated (Number of revolution)	*		
	Oil filter unit for Oil type OLTC	*		
	Motor drive unit:			
	Type	*		
	Power	*		
	Rated Voltage (V_{ac})/(V_{dc})			
	Number of phases			
	Control voltage (V_{ac} or V_{dc})			
	Space heater (V_{ac})	230		
	Heater Wattage (W)	*		
	Provision of parallel operation along with Supervisory Equipment	Yes/No		
	Oil/Gas Surge Relay for OLTC			
	Manufacturer	*		
	Type Designation	*		
	Alarm Contact Current Rating at 125 V_{dc} (A)	*		



7.0 DATA SCHEDULE

POWER TRANSFORMERS,
RATED ABOVE 2.5 MVA

REFERENCE

SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4.5 (continued)				
	Pressure Relief Device (OLTC)			
	Manufacturer	*		
	Type Designation	*		
	Number of Pressure Relief Device(s)	*		
	Resealing Pressure (kPa)	*		
	Number of alarm/trip contacts	2		
	Alarm Contact Current Rating at 125 V _{dc} (A)	*		
4.6.1	Oil Temperature Indicator			
	Manufacturer	*		
	Type Designation	*		
	Type of Liquid Sensing Element	*		
	Provision of maximum indicator	Yes/No		
	Adjustment Range of Alarm and Trip contacts (From_to_°C)	0-160°C		
	Adjustment Range of Forced cooling contacts (From_to_°C)	0-160°C		
	Contact Current Rating at 125 V _{dc} (A)	*		
	Number of contacts	4		
4.6.2	Winding Temperature Indicator			
	Manufacturer	*		
	Type Designation	*		
	Type of Liquid Sensing Element	*		
	Provision of maximum indicator	Yes/No		
	Adjustment Range of Alarm and Trip contacts (From_to_°C)	0-160°C		
	Adjustment Range of Forced cooling contacts (From_to_°C)	0-160°C		
	Contact Current Rating at 125 V _{dc} (A)	*		
	Number of contacts	4		
4.6.3.c	No. of sensors			
	HV Winding			
	LV Winding			



7.0 DATA SCHEDULE

POWER TRANSFORMERS,
RATED ABOVE 2.5 MVA

REFERENCE

SECTIONNO.DESCRIPTION'A''B''C'

4.8	Buchholz Relay			
	Manufacturer	*		
	Type Designation	*		
	Alarm/Trip Contact Current			
	Rating at 125 V _{dc} (A)	*		
4.9	Pressure Relief Device (Main Tank)			
	Manufacturer	*		
	Type Designation	*		
	Pressure Range for Operation	*		
	Resealing Pressure (kPa)	*		
	Number of alarm/trip contacts	2		
	Alarm Contact Current Rating at 125 V _{dc} (A)	*		
	Rapid Pressure Rise Relay	Yes/No		
4.10	Bushings			
	High Voltage Bushings			
	Manufacturer & Country	*		
	Type designation	*		
	Material	*		
	Location (top, side, others)			
	Terminal take off angle (vertical, horizontal, angle)			
	Number			
	Rated Voltage (kV)			
	Rated Maximum Voltage (kV)			
	Rated current (A)	*		
	BIL (kV _{peak})	*		
	Switching Impulse Withstand Voltage, if applicable (kV _{peak})	*		
	Power Frequency Dry/Wet Withstand Voltage (kV _{rms})	*		
	Creepage distance (mm)	*		
	Cantilever strength (kN)	*		



7.0 DATA SCHEDULE

POWER TRANSFORMERS,
RATED ABOVE 2.5 MVA

REFERENCE SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4.10 (continued)				
	Mounting details			
	Hole circle diameter of the flange (mm)	*		
	Number of bolts	*		
	Hole diameter (mm)	*		
	Terminal			
	Type	*		
	Size	*		
	No. of holes, if applicable	*		
	Low Voltage Bushing			
	Manufacturer & Country	*		
	Type designation	*		
	Material	*		
	Location (top, side, others)			
	Terminal take off angle (vertical, horizontal, angle)			
	Number			
	Rated Voltage (kV)			
	Rated Maximum Voltage (kV)			
	Rated current (A)	*		
	BIL (kV _{peak})	*		
	Power Frequency Dry/Wet Withstand Voltage (kV _{rms})	*		
	Creepage distance (mm)	*		
	Cantilever strength (kN)	*		
	Mounting Details			
	Hole circle diameter of the flange (mm)	*		
	Number of bolts	*		
	Hole circle diameter (mm)	*		
	Terminal			
	Type	*		
	Size	*		
	No. of holes, if applicable	*		



7.0 DATA SCHEDULE

POWER TRANSFORMERS,
RATED ABOVE 2.5 MVA

REFERENCE

SECTIONNO.DESCRIPTION

'A'

'B'

'C'

4.10 (continued)

HV Neutral Bushing

Manufacturer & Country

*

Type designation

*

Material

*

Location (top, side, others)

Terminal take off angle

(vertical, horizontal, angle)

Rated Voltage (kV)

*

Rated Maximum Voltage (kV)

*

Rated current (A)

*

BIL (kV_{peak})

*

Power Frequency Dry/Wet

Withstand Voltage (kV_{rms})

*

Creepage distance (mm)

*

Cantilever strength (kN)

*

Mounting details

Hole circle diameter of the
flange (mm)

*

Number of bolts

*

Hole circle diameter (mm)

*

Terminal

Type

*

Size

*

No. of holes, if applicable

*

LV Neutral Bushing/Common Neutral
Bushing for Auto Transformer

Manufacturer

*

Type designation

*

Material

*

Location (top, side, others)

Terminal take off angle

(vertical, horizontal, angle)

Rated Voltage (kV)

*



7.0 DATA SCHEDULE

POWER TRANSFORMERS,
RATED ABOVE 2.5 MVA

REFERENCE SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4.10 (continued)				
	Rated Maximum Voltage (kV)	*		
	Rated current (A)	*		
	BIL (kV _{peak})	*		
	Power Frequency Dry/Wet Withstand Voltage (kV _{rms})	*		
	Creepage distance (mm)	*		
	Cantilever strength (kN)	*		
	Mounting details			
	Hole circle diameter of the flange (mm)	*		
	Number of bolts	*		
	Hole circle diameter (mm)	*		
	Terminal			
	Type	*		
	Size	*		
	No. of holes, if applicable	*		
	Tertiary Bushing			
	Manufacturer & Country	*		
	Type designation	*		
	Material	*		
	Location (top, side, others)			
	Terminal take off angle (vertical, horizontal, angle)			
	Rated Voltage (kV)			
	Rated Maximum Voltage (kV)	*		
	Rated current (A)	*		
	BIL (kV _{peak})	*		
	Power Frequency Dry/Wet Withstand Voltage (kV _{rms})	*		
	Creepage distance (mm)	*		
	Cantilever strength (kN)	*		
	Mounting details			
	Hole circle diameter of the flange (mm)	*		
	Number of bolts	*		
	Hole circle diameter (mm)	*		



7.0 DATA SCHEDULE

POWER TRANSFORMERS,
RATED ABOVE 2.5 MVA

REFERENCE SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4.10 (continued)	Terminal			
	Type	*		
	Size	*		
	No. of holes, if applicable	*		
4.13 & 4.14	Cooling Equipment			
	Fans	*		
	Manufacturer & Country			
	Number of cooling fans (main/spare)	*		
	Number of cooling fan groups	*		
	Power rating of each fan	*		
	Supply Voltage (V_{ac})	*		
	Number of phases	*		
	Number of wires	*		
	Total fan consumption at full load (kW)	*		
	Degree of protection for fan blades	*		
	Pumps			
	Manufacturer & Country			
	Number of oil pumps	*		
	Type designation	*		
	Motor rating (kW/HP)	*		
	Supply Voltage (V_{ac})	*		
	Number of phases	*		
	Number of wires	*		
	Degree of protection for motor pumps	*		
	Total Power Consumption at full load (kW)	*		
4.15	Conservator			
4.15.2.	Oil Level Indicator for the Main Tank			
	Manufacturer & Country	*		
	Type Designation	*		
	Alarm Contact Current Rating at 125 V_{dc} (A)	*		



7.0 DATA SCHEDULE

POWER TRANSFORMERS,
RATED ABOVE 2.5 MVA

REFERENCE SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4.15.2 (continued)				
	Oil level indicator for OLTC			
	Manufacturer & Country	*		
	Type Designation	*		
	Alarm Contact Current rating at 125 V _{dc} (A)	*		
	Conservator Expansion Device Material	*		
	Manufacturer & Country	*		
4.17	Drain, Filter and Sampling Valves (attach drawing for each type of valve) Manufacturer & Country for each valve			
	Type & Size of Oil Drain Valve (mm)	50		
	Type and Size of Filtration Valve (mm)	50		
	Size of Oil Sampling Valve/s (mm)	20		
	Type & Size of Radiator Valves (mm)	*		
4.19	Transformer Moving Facilities			
	Transformer Base Type	Skid/ Wheels		
	Wheel Details			
	Wheels Center to Center Distance (1100/2100/3100mm)	*		
4.20	Ladder	Yes/No		
		clause		
4.22	Transformer Terminal Markings	4.20/ IEC 60616		
4.23	Transformer Mineral Oil (Manufacturer shall fill up column "B" of 54-TMSS-01 Data Schedule)	*		



7.0 DATA SCHEDULE

POWER TRANSFORMERS,
RATED ABOVE 2.5 MVA

REFERENCE

SECTIONNO.DESCRIPTION

'A'

'B'

'C'

4.24 Bushing Current Transformer

High Voltage Bushing Current Transformers

Manufacturer & Country

*

Type Designation

*

No. of CTs per phase

Continuous Thermal Current Rating Factor

Metering CT

Protection CT

Multi Ratio CTs (MRCT)

Single Ratio CTs

Rated Short Time Withstand Current

Thermal I_{th} (kA)

*

Dynamic (kA_{peak}) $2.6 \times I_{th}$ Short Time Thermal Current duration
(sec.)

Rated primary short circuit current

 I_{psc} (kA)

*

Temperature Rise ($^{\circ}C$)

*

Core No.

1 /2 /3

1 /2 /3

Purpose (Relaying or Metering)

/ /

/ /

Type of Protection

(Back-up/differential/Distance/REF etc.)

/ /

/ /

Current Ratio at specified tap

/ /

/ /

Accuracy Class

/ /

/ /

Burden (VA)/Resistive Burden- R_b (ohms)

/ /

/ /

Secondary Winding Resistance at $20^{\circ}C$, R_{ct}
(ohms)

/ /

/ /



7.0 DATA SCHEDULE

POWER TRANSFORMERS,
RATED ABOVE 2.5 MVA

REFERENCE

SECTIONNO.DESCRIPTION'A''B''C'

4.24 (continued)

For class TPS CTs per IEC

Rated symmetrical short circuit current

factor - K_{SSC}

*/ * /*

/ /

Dimensioning parameter -K

*/ * /*

/ /

Excitation limiting secondary voltage

- U_{al} (Volts)*

*/ * /*

/ /

Accuracy limiting secondary exciting

current - I_{al} (mA)

*/ * /*

/ /

Secondary excitation current- I_{mag}

at half excitation limiting secondary

voltage (mA)

*/ * /*

/ /

For class C or K CTs per IEEE / Class P CTper IECMagnetizing current - I_{mag} (mA)

*/ * /*

/ /

Knee point voltage - V_k (Volts)/

/Secondary limiting e.m.f

*/ * /*

/ /

Low Voltage Bushing Current
Transformers

Manufacturer

*

Type Designation

*

No. of CTs per phase

.....

Continuous Thermal Current Rating Factor

Metering CT

Protection CT

Multi Ratio CTs (MRCT)

Single Ratio CTs

Rated Short Time Withstand Current

Thermal I_{th} (kA)

*

Dynamic (kA_{peak}) $2.6 \times I_{th}$

Short Time Thermal Current duration

(sec.)

Rated primary short circuit current

 I_{PSC} (kA)

*

Temperature Rise ($^{\circ}C$)

*



7.0 DATA SCHEDULE

POWER TRANSFORMERS,
RATED ABOVE 2.5 MVA

REFERENCE

SECTIONNO.DESCRIPTION

'A'

'B'

'C'

4.24 (continued)

Core No.

1 /2 /3

1 /2 /3

Purpose (Relaying or Metering)

/ /

/ /

Type of Protection

(Back-up/differential/Distance/REF etc.)

/ /

/ /

Current Ratio at specified tap

/ /

/ /

Accuracy Class

/ /

/ /

Burden (VA)/Resistive Burden- R_b (ohms)

/ /

/ /

Secondary Winding Resistance at 20°C,
 R_{ct} (ohms)

/ /

/ /

For class TPS CTs per IECRated symmetrical short circuit current
factor - K_{SSC}

*/ * /*

/ /

Dimensioning parameter -K

*/ * /*

/ /

Excitation limiting secondary voltage
- U_{al} (Volts)*

*/ * /*

/ /

Accuracy limiting secondary exciting
current - I_{al} (mA)

*/ * /*

/ /

Secondary excitation current- I_{mag}
at half excitation limiting secondary
voltage (mA)

*/ * /*

/ /

For class C or K CTs per IEEE / Class P CT
per IECMagnetizing current - I_{mag} (mA)

*/ * /*

/ /

Knee point voltage - V_k (Volts)/
Secondary limiting e.m.f

*/ * /*

/ /

High Voltage Neutral Bushing Current
Transformers

Manufacturer

*

Type Designation

*

No. of CTs

Continuous Thermal Current Rating Factor

Protection CT

Multi Ratio CTs (MRCT)



7.0 DATA SCHEDULE

POWER TRANSFORMERS,
RATED ABOVE 2.5 MVA

REFERENCE

SECTIONNO.DESCRIPTION

'A'

'B'

'C'

4.24 (continued)

Single Ratio CTs

Rated Short Time Withstand Current

Thermal I_{th} (kA)

*

Dynamic (kA_{peak}) $2.6 \times I_{th}$ Short Time Thermal Current duration
(sec.)Rated primary short circuit current
 I_{PSC} (kA)

*

Temperature Rise ($^{\circ}C$)

*

Core No.

1 / 2

1 / 2

Type of Protection
(differential/ REF etc.)

/

/

Current Ratio at specified tap

/

/

Accuracy Class

/

/

Burden (VA)/Resistive Burden- R_b (ohms)

/

/

Secondary Winding Resistance at $20^{\circ}C$,
 R_{ct} (ohms)

/

/

For class TPS CTs per IECRated symmetrical short circuit current
factor - K_{SSC}

/

/

Dimensioning parameter -K

/

/

Excitation limiting secondary voltage
- U_{al} (Volts)*

/

/

Accuracy limiting secondary exciting
current - I_{al} (mA)

/

/

Secondary excitation current- I_{mag}
at half excitation limiting secondary
voltage (mA)

/

/

For class C or K CTs per IEEE / Class P CT
per IECMagnetizing current - I_{mag} (mA)

/

/



7.0 DATA SCHEDULE

POWER TRANSFORMERS,
RATED ABOVE 2.5 MVA

REFERENCE

SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4.24 (continued)				
	Knee point voltage $-V_k$ (Volts)/ /Secondary limiting e.m.f	*/*	/	
	Low Voltage Neutral/Common Neutral Bushing Current Transformers for Auto Transformer			
	Manufacturer	*		
	Type Designation	*		
	No. of CTs			
	Continuous Thermal Current Rating Factor			
	Protection CT			
	Multi Ratio CTs (MRCT)			
	Single Ratio CTs			
	Rated Short Time Withstand Current			
	Thermal I_{th} (kA)	*		
	Dynamic (kA _{peak})	$2.6 \times I_{th}$		
	Short Time Thermal Current duration (sec.)			
	Rated primary short circuit current			
	I_{PSC} (kA)	*		
	Temperature Rise (°C)	*		
	Magnetizing curve enclosed	*	Yes/No	
	Core No.	1 / 2	1 / 2	
	Type of Protection (differential/Distance/REF etc.)	/	/	
	Current Ratio at specified tap	/	/	
	Accuracy Class	/	/	
	Burden (VA)/Resistive Burden- R_b (ohms)	/	/	
	Secondary Winding Resistance at 20°C, R_{ct} (ohms)	/	/	
	Temperature Rise (°C)	*		



7.0 DATA SCHEDULE

POWER TRANSFORMERS,
RATED ABOVE 2.5 MVA

REFERENCE SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4.24 (continued)				
	<u>For class TPS CTs per IEC</u>			
	Rated symmetrical short circuit current factor - K_{SSC}	*/	/	
	Dimensioning parameter -K	*/	/	
	Excitation limiting secondary voltage - U_{al} (Volts)*	*/	/	
	Accuracy limiting secondary exciting current - I_{al} (mA)	*/	/	
	Secondary excitation current- I_{mag} at half excitation limiting secondary voltage (mA)	*/	/	
	<u>For class C or K CTs per IEEE / Class P CT per IEC</u>			
	Magnetizing current - I_{mag} (mA)	*/	/	
	Knee point voltage - V_k (Volts)/ /Secondary limiting e.m.f	*/	/	
	Tertiary Bushing Current Transformer			
	Manufacturer	*		
	Type Designation	*		
	No. of CTs per phase			
	Continuous Thermal Current Rating Factor			
	Protection CT			
	Multi Ratio CTs (MRCT)			
	Single Ratio CTs			
	Rated Short Time Withstand Current			
	Thermal I_{th} (kA)	*		
	Dynamic (kA_{peak})	$2.6 \times I_{th}$		
	Short Time Thermal Current duration (sec.)			
	Rated primary short circuit current I_{PSC} (kA)	*		
	Temperature Rise ($^{\circ}C$)	*		



7.0 DATA SCHEDULE

POWER TRANSFORMERS,
RATED ABOVE 2.5 MVA

REFERENCE

SECTIONNO.DESCRIPTION

'A'

'B'

'C'

4.24 (continued)

Core No.

1 / 2

Type of Protection

(differential/ REF etc.)

/

Current Ratio at specified tap

/

Accuracy Class

/

Burden (VA)/Resistive Burden- R_b (ohms)

/

Secondary Winding Resistance at 20°C,
 R_{ct} (ohms)

/

For class TPS CTs per IECRated symmetrical short circuit current
factor - K_{SSC}

/

Dimensioning parameter -K

/

Excitation limiting secondary voltage
- U_{al} (Volts)*

/

Accuracy limiting secondary exciting
current - I_{al} (mA)

/

Secondary excitation current- I_{mag}
at half excitation limiting secondary
voltage (mA)

/

For class C or K CTs per IEEE / Class P CT
per IECMagnetizing current - I_{mag} (mA)

/

Knee point voltage - V_k (Volts)/
/Secondary limiting e.m.f

/

Bushing Current Transformers for W.T.I

Manufacturer

*

Type Designation

*

Ratio

HV

*

LV

*

TV

*

Burden (VA)

*

Accuracy Class

*



7.0 DATA SCHEDULE

POWER TRANSFORMERS,
RATED ABOVE 2.5 MVA

REFERENCE SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4.24	Terminations			
	Termination for HV Winding			
	Open Bushings (oil/Air)	Yes/No		
	Type of conductor			
	Conductor material			
	Conductor size (mm ²)			
	Cable Box			
	Type of cable			
	Cable size (mm ²)			
	Material			
	Number of phase			
	Method of termination (Pothead, stress cone, heat shrinkable)			
	Number of terminations			
	Terminal enclosure required	Yes/No		
	Type (Air, Oil)			
	Incoming cable take off method (Vertical, horizontal, Angle to horizontal)			
	GIS (Oil/ SF ₆) (For details refer to 32-TMSS-02 Data Schedule and attach relevant data)	Yes/No		
	Bus Duct (If bus duct is required, full details will follow order Placement)	Yes/No		
	Termination for LV winding			
	Open Bushings (oil/Air)	Yes/No		
	Type of conductor			
	Conductor material			
	Conductor size (mm ²)			



7.0 DATA SCHEDULE

POWER TRANSFORMERS,
RATED ABOVE 2.5 MVA

REFERENCE

SECTIONNO.DESCRIPTION

'A'

'B'

'C'

4.24 (continued)

Cable Box

Type of cable

Cable size (mm²)

Material

Number of phase

Method of termination

(Pothead, stress cone,
heat shrinkable)

Number of terminations

Terminal enclosure required

Yes/No

Type (Oil, Oil)

Yes/No

Incoming cable take off method
(Vertical, horizontal, Angle to
horizontal)GIS (Oil/ SF₆)

(For details refer to 32-TMSS-02

Data Schedule and attach relevant data)

Yes/No

Bus Duct

(If bus duct is required, full details will
follow order Placement)

Yes/No

Termination for Tertiary Windings

Open Bushings

Yes/No

Type of conductor

Conductor material

Conductor size (mm²)

Cable Box

Type of cable

Cable size (mm²)

Material

Number of phase

Method of termination

(Pothead, stress cone, heat shrinkable)



7.0 DATA SCHEDULE

POWER TRANSFORMERS,
RATED ABOVE 2.5 MVA

REFERENCE

SECTIONNO.DESCRIPTION

'A'

'B'

'C'

4.24 (continued)

Number of terminations

Terminal enclosure required

Type (Air, Oil)

Incoming cable take off method
(Vertical, horizontal, Angle to
horizontal)GIS (Oil/ SF₆)

(For details refer to 32-TMSS-02

Data Schedule and attach relevant data)

Bus Duct

(If bus duct is required, full details will
follow order Placement)

4.25

Surge Arresters

Provision for Surge Arresters mounting
required(If surge arresters are required
Data Schedule of 35-TMSS-01 shall
be completed and attached by the
specifying engineer)

4.26

On line Gas Analyzer with moisture
AnalyzerAUXILIARY SUPPLIESVoltage for Motors and Controls (V_{ac}/V_{dc})

Number of phases

Number of wires

DC Voltage for Control and
Protection.(V_{dc})



7.0 DATA SCHEDULE

POWER TRANSFORMERS,
RATED ABOVE 2.5 MVA

REFERENCE

SECTIONNO.DESCRIPTION

'A'

'B'

'C'

5.0 WEIGHT AND DIMENSIONS

Weight of Core and Coil Assembly (kg)

*

Weight of Core (kg)

*

Weight of Copper (kg)

*

Weight of Oil (kg)

*

Total Weight (kg)

with oil

*

without oil

*

Shipping Weight (kg)

*

Volume of Oil - Main Tank (liters)

*

Volume of Oil - Conservator (liters)

*

Overall Dimensions of the Assembled
Transformer

Height (mm)

*

Width (mm)

*

Length (mm)

*

Maximum Shipping Dimension
Transformer

Height (mm)

*

Width (mm)

*

Length (mm)

*

Shipping

Maximum permissible acceleration
during shipment in, (g)

Lateral direction

*

Longitudinal direction

*



7.0 DATA SCHEDULE

POWER TRANSFORMERS,
RATED ABOVE 2.5 MVA

REFERENCE

SECTION NO.DESCRIPTION'A''B''C'

5.0 (continued)

Vertical direction

*

Maximum Guaranteed Permanent
Deflection

Under Pressure test. (mm)

*

Under Vacuum test (mm)

*

6.3 Special Tests

Please list special tests that shall be required

TRANSPORTATION LIMITATIONS(If yes, specify the maximum
overall dimensions of the transformer or
attach the route or profile)

*

7.0 DATA SCHEDULE

POWER TRANSFORMERS,
RATED ABOVE 2.5 MVA

- A. ADDITIONAL TECHNICAL INFORMATION OR FEATURES TO BE FURNISHED BY NATIONAL GRID, SAUDI ARABIA:
- B. ADDITIONAL SUPPLEMENTARY DATA OR FEATURES PROPOSED BY BIDDER/VENDOR/SUPPLIER/CONTRACTOR:
- C. OTHER PARTICULARS TO BE FILLED UP BY BIDDER/VENDOR/SUPPLIER/ CONTRACTOR:

	Actual Manufacturer of Equipment/Material	Vendor/Supplier/ Contractor
Name of the Company	_____	_____
Location and address	_____ _____	_____ _____
Name and Signature of authorized representative and date	_____ _____ _____	_____ _____ _____
Official Seal/Stamp of the Company & Date	_____	_____

7.0 DATA SCHEDULE

UNINHIBITED INSULATING MINERAL OIL

Enquiry No. _____ Date: _____

Purchase Order No. _____ Date: _____
or Contract No.

PTS No./Project Title with J.O. No. _____

REFERENCE

SECTION NO.	DESCRIPTION	'A'	'B'	'C'
3.0	APPLICABLE INDUSTRY. STANDARD	<u>IEC 60296</u>	_____	_____
4.0	PERFORMANCE REQUIREMENTS AND CHARACTERISTICS			
	Classification/Type of oil	*	_____	_____
	Manufacturer's Designation of oil	*	_____	_____

'A' - NATIONAL GRID, SAUDI ARABIA SPECIFIED DATA/PARAMETER

'B' - BIDDER/SUPPLIER/VENDOR/CONTRACTOR PROPOSED
DATA/PARAMETERS

'C' - REMARKS SUPPORTING THE PROPOSED DEVIATION IN COLUMN 'B'

(*) - DATA/PARAMETER TO BE PROVIDED/PROPOSED BY THE BIDDER/
SUPPLIER/VENDOR/CONTRACTOR IN COLUMN 'B'.



7.0 DATA SCHEDULE

UNINHIBITED INSULATING MINERAL OIL

REFERENCE SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4 (Cont'd)	Type of crude oil used	*		
	<u>Oil before Filling in Transformer</u>			
	Appearance/visual examination	clear free from sediment & suspen- ded matter		
	Color, Max.	*		
	Kinetic Viscosity, Max. (mm ² /s) at :			
	-30°C (ISO 3104)	<u>1800</u>		
	+ 40 °C (ISO 3104)	<u>12</u>		
	Flash point, Min. (°C) (ISO 2719)	<u>135</u>		
	Pour point, Max. (°C) (ISO 3016)	<u>-40</u>		
	Density, Max, (g/cm ³)			
	+ 20°C (ISO3675/ISO12185)	<u>0.895</u>		
	Interfacial tension at 25°C, Min. (dynes/cm) (EN14210/ASTM D971)	<u>40</u>		

7.0 DATA SCHEDULE

UNINHIBITED INSULATING MINERAL OIL

REFERENCE

SECTION NO.

4 (Cont'd)

DESCRIPTION

'A'

'B'

'C'

Dielectric Breakdown Voltage
at 60Hz, Min. (kV) (IEC 60156)

- As delivered

30

Dielectric Dissipation Factor
(Loss Tangent), at 60Hz, Max. at
(IEC 60247/IEC 61620):

90 °C

0.005

Particle Content (IEC 60970)

No Genl. Reqmt

Acidity Max. (mg KOH/g)
(IEC 62021-1/IEC 62021-2)

0.01

Oxidation Stability :
IEC 61125(C)

- Test Duration

164H

-Total Acid number,Max. (mg KOH/g)
(Cl. 1.9.4 of IEC 61125)

1.2

-Sludge, Max (% by mass)
(Cl. 1.9.1 of IEC 61125)

0.8

- DDF at 90°C Max.
(Cl. 1.9.6 of IEC 61125 Amedtmt. 1 + IEC 60247)

0.500

Water content at delivery, Max (ppm)
(IEC 60814)

- in Drums

40

- in Tank container

30

Total Sulphur content, Max.
(IP 373/ISO14596)

*

Corrosive Sulphur
(DIN 51353)

Non Corrosive

7.0 DATA SCHEDULE

UNINHIBITED INSULATING MINERAL OIL

REFERENCE SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4 (Cont'd)	Inhibitors (IEC 60666) (U-Uninhibited) Presence of Anti oxidant	<u>Not Detectable</u>	_____	_____
	Metal Passivator Additives (IEC 60666)	<u>Not Detectable</u>	_____	_____
	Anti Oxidants (IEC 60666)	<u>Not Detectable</u>	_____	_____
	Lowest cold start energizing Temperature (LCSET)	*	_____	_____
	P. C. B Content (IEC 61619)	<u>Not Detectable</u>	_____	_____
	P. C. A Content, Max. (%) 3.0 (IP 346)	*	_____	_____
	2-Furfural and related compounds, Max. (mg/kg) <0.05 (IEC 61198)	<u>Not Detectable</u>	_____	_____
	Stray Gassing (Cl. 6.22 of IEC 60296)	*	_____	_____
	Gassing Tendency, Max. (µL/min.) IEC 60628 (A) H ₂	<u>+30</u>	_____	_____
5.2	Corrosive Sulphur Per IEC 62535	<u>Noncorrosive</u>	_____	_____
5.3	DBDS (IEC 62697-1)	<u>Not Detectable</u>	_____	_____



7.0 DATA SCHEDULE

UNINHIBITED INSULATING MINERAL OIL

REFERENCE SECTION NO.	DESCRIPTION	'A'	'B'	'C'
5.6.1	Electrostatic charging tendency (if applicable)	*		
6.0	<u>MODE OF DELIVERY</u>			
	Drums or tank container capacity	*		
	Total number of drums or tank container	*		
	Weight of oil in each drum or tank container	*		

7.0 DATA SCHEDULE

UNINHIBITED INSULATING MINERAL OIL

- A. ADDITIONAL TECHNICAL INFORMATION OR FEATURES TO BE FURNISHED BY NATIONAL GRID, SAUDI ARABIA:
- B. ADDITIONAL SUPPLEMENTARY DATA OR FEATURES PROPOSED BY BIDDER/VENDOR/SUPPLIER/CONTRACTOR:
- C. OTHER PARTICULARS TO BE FILLED UP BY BIDDER/VENDOR/SUPPLIER/ CONTRACTOR:

	Actual Manufacturer of Equipment/Material	Vendor/Supplier/ Contractor
Name of the Company	_____	_____
Location and address	_____ _____	_____ _____
Name and Signature of authorized representative and date	_____ _____ _____	_____ _____ _____
Official Seal/Stamp of the Company & Date	_____	_____

6.0 DATA SCHEDULE

OIL IMMERSED SHUNT REACTOR 33kV THROUGH 380kV

National Grid Saudi Arabia Enquiry No. _____ Date: _____

National Grid Saudi Arabia Purchase Order No. _____ Date: _____
 or Contract No. _____

National Grid Saudi Arabia PTS No./Project Title with J.O. No. _____

REFERENCE
SECTION NO.
DESCRIPTION**'A'****'B'****'C'****3.0 APPLICABLE CODES AND STANDARDS**

Applicable Industry Standard

*

4.0 DESIGN AND CONSTRUCTION REQUIREMENTS

Model Designation

*

4.1 No. of phases

3/1

4.2 Performance Characteristics and Rating

Fixed/Variable

Regulation Range (% of Maximum
Rated Power) for Variable Shunt Reactor

Rated Power (Mvar) at Rated Voltage

Cooling method

Rated nominal system Voltage
(33kV or 34.5, 69, 110, 115, 132, 230, 380)

Maximum operating voltage (Um) kV

Linearity (%)

Frequency (Hz)

60

A'- NATIONAL GRID SAUDI ARABIA SPECIFIED DATA/PARAMETER.

B'- BIDDER/SUPPLIER/VENDOR/CONTRACTOR PROPOSED DATA/PARAMETERS.

C'- REMARKS SUPPORTING THE PROPOSED DEVIATION IN COLUMN 'B'.

(*)- DATA/PARAMETER TO BE PROVIDED/PROPOSED BY THE BIDDER/SUPPLIER/
VENDOR/CONTRACTOR IN COLUMN 'B'.

6.0 DATA SCHEDULE

OIL IMMERSED SHUNT REACTOR 33kV THROUGH 380kV

REFERENCE SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4.2	<i>(Continued)</i>			
	Rated short time current (kA)			
	Duration (sec)			
	Type	Line Reactor/ Bus Reactor		
	Noise level			
	ONAN rating (dB)	*		
	ONAF rating (dB) (if specified)	*		
	Vector group	YN		
	Reactance:			
	100% rated voltage (ohms)	*		
	110% rated voltage (ohms)	*		
	Maximum Tap Position (ohms)	*		
	Intermediate Tap Position (ohms)	*		
	Minimum Tap Position (ohms)	*		
	Zero sequence reactance (ohms)	*		
	Mutual reactance (ohms)	*		
	Harmonic current (%)			
	3 rd harmonic (%)	*		
	5 th harmonic (%)	*		
	Permissible unbalance current among different phases (%)			
	Ratio of zero sequence reactance to positive sequence reactance			
	Max. rated power at rated voltage (Mvar)	*		
	Min. rated power at rated voltage (Mvar)	*		
	Max. rated power at max. voltage (Mvar)	*		
	Min. rated power at max. voltage (Mvar)	*		
	Max. rated current (A) at rated voltage	*		
	Min. rated current (A) at rated voltage	*		
	Max. rated current (A) at max. voltage	*		
	Min. rated current (A) at max. voltage	*		

6.0 DATA SCHEDULE

OIL IMMERSED SHUNT REACTOR 33kV THROUGH 380kV

REFERENCE SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4.2	<i>(Continued)</i>			
	Temperature Rise Based on Ambient Conditions Specified in 01-TMSS-01			
	Winding (°C)	*		
	Oil (°C)	*		
	Winding maximum (Hot spot) temperature	*		
	Low Voltage Winding	Yes/No		
	Rated Voltage(V)	400V _{ac}		
	Rating (kVA)			
4.3	Construction			
4.3.1	Maximum Design Flux Density at Rated Voltage (Tesla)	*		
	Flux density at 110% rated voltage (Tesla)	*		
	Saturation Voltage (%U _N)	*		
	Knee Point in Magnetic flux versus Current curve (curve to be enclosed)	*	Yes/No	
4.3.2	Maximum Impulse Withstand Voltage			
	Line Terminal (kV _{peak})	*		
	Neutral Terminal (kV _{peak})	*		
	Separate Source Power Frequency Withstand Voltage			
	Line Terminal (kV _{rms})	*		
	Neutral Terminal (kV _{rms})	*		
	Switching impulse withstand voltage			
	Line Terminal (kV _{peak})	*		
	Neutral External Connection	Solid Grounding/ Neutral Reactor		

6.0 DATA SCHEDULE

OIL IMMERSED SHUNT REACTOR 33kV THROUGH 380kV

REFERENCE

SECTION NO.

DESCRIPTION

'A'

'B'

'C'

4.3.2 *(Continued)*

Winding Insulation

Uniform/
Non-
uniform

4.3.3/4.3.4 Type of tank construction

Tank Cover

Welded

Min. thickness of tank steel (mm)

*

Min. Thickness of radiator plates (mm)

*

Maximum Positive Withstand Pressure
of Tank and Radiators (kPa)

*

Minimum Vacuum Withstand (kPa)

*

4.3.6 Guaranteed Losses at 100% rated voltage
Losses at:

*

110% rated voltage (kW)

*

Auxiliary Losses

*

Maximum Tap Position (kW)

*

Intermediate Tap Position (kW)

*

Minimum Tap Position (kW)

*

4.3.7 Buchholz Relay

Manufacturer

*

Type Designation

*

Alarm/Trip Contact Current Rating at
125Vdc

*

4.3.8 Pressure Relief Device for Main Tank

Manufacturer

*

Type Designation

*

Number of Pressure Relief Device(s)

*

Pressure Range for Operation
(From to kPa)

*

Resealing Pressure (kPa)

*

Number of alarm/trip contacts

2

Alarm Contact Current Rating at 125
Vdc (A)

*

4.3.9 Maintenance free Breather

Yes/No

6.0 DATA SCHEDULE

OIL IMMERSED SHUNT REACTOR 33kV THROUGH 380kV

REFERENCE SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4.3.10	Oil Temperature Indicator			
	Manufacturer	*		
	Type Designation	*		
	Type of Liquid Sensing Element	*		
	Provision of maximum indicator	Yes/No		
	Adjustment Range of Alarm and Trip contacts (From_to_°C)	0-160°C		
	Contact Current Rating at 125 V _{dc} (A)	*		
	Number of contacts	4		
4.3.11	Winding Temperature Indicator			
	Manufacturer	*		
	Type Designation	*		
	Provision of Maximum Indicator	Yes/No		
	Adjustment Range of Alarm and Trip Contacts (From_to_°C)	0-160°C		
	Contact Current Rating at 125 V _{dc} (A)	*		
	Number of contacts	4		
4.3.12	Fiber Optic Sensors	Yes/No		
	Manufacturer	*		
	Type Designation	*		
	No. of Fiber Optic Sensors	*		
4.3.13	Oil Level Indicator			
	Manufacturer	*		
	Type Designation	*		
	Alarm Contact Current Rating at 125 V _{dc} (A)	*		
4.3.14	Off Load Tap Changer			
	Manufacturer	*		
	Number of steps			
	Step Voltage (%)			
	Tapping Range (%)			

6.0 DATA SCHEDULE

OIL IMMERSED SHUNT REACTOR 33kV THROUGH 380kV

REFERENCE
SECTION NO.

DESCRIPTION

'A'

'B'

'C'

4.3.15 Onload Tap Changer (OLTC)

Manufacturer

*

Country of origin

*

Type

Vacuum

Type Designation

*

Tap Arrangement

(Linear, Reversing or Coarse/fine)

*

Number of steps

Step Voltage (%)

Size of reactive power each

Steps (Mvar)

2.5

Regulation Range (%)

Rated Through Current (A)

*

Short Circuit Current (kA)

*

Dynamic short circuit current
(kA_{peak})

*

Location (In-tank type fitted inside
reactor main tank/outside reactor
main tank or External mounted type)

*

Voltage Class (kV_{rms})

*

BIL (kV_{peak})

*

Type of transition impedance (high
resistance)

*

Time of transfer from one step to
another

- motor-operated (seconds)

*

- manually operated (Number of
revolution)

*

Oil filter unit for OLTC

*

Motor drive unit:

Type

*

Power

*

Rated Voltage (V_{ac})/(V_{dc})

*

Number of phases

*

Control voltage (V_{ac} or V_{dc})

*

Space heater (V_{ac})

*

Heater Wattage (W)

*

6.0 DATA SCHEDULE

OIL IMMERSED SHUNT REACTOR 33kV THROUGH 380kV

REFERENCE SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4.3.15	<i>(Continued)</i>			
	Oil/Gas Surge Relay for OLTC	*		
	Manufacturer	*		
	Country of origin	*		
	Type Designation	*		
	Alarm/Trip Contact Current Rating at 125 V _{dc} (A)	*		
	Pressure Relief Device (OLTC)			
	Manufacturer	*		
	Country of origin	*		
	Type Designation	*		
	Number of Pressure Relief Device(s)	*		
	Resealing Pressure (kPa)	*		
	Number of alarm/trip contacts	*		
	Alarm/Trip Contact Current Rating at 125 V _{dc} (A)	*		
4.3.16	Ladder	Yes/No		
4.3.17	Drain, Filter and Sampling Valves			
	Type & Size of Oil Drain Valve (mm) (attach drawing)	50		
	Type and Size of Filtration Valves (mm) (attach drawing)	50		
	Size of Oil Sampling Valve/s (mm) (attach drawing)	20		
	Type & Size of Radiator Valves (mm) (attach drawing)	*		
4.3.19	Moving Facilities			
	Reactor Base Type	Skid/Wheels		
	Wheel Details			
	Wheels Center to Center Distance (1100/2100/3100mm)	*		

6.0 DATA SCHEDULE

OIL IMMERSED SHUNT REACTOR 33kV THROUGH 380kV

REFERENCE SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4.3.23	Bushings			
	High Voltage Bushings:			
	Manufacturer	*		
	Type designation	*		
	Material	*		
	Location (top, side, others)			
	Terminal take off angle (vertical, horizontal, angle)			
	Number			
	Rated Voltage (kV)			
	Rated Maximum Voltage (kV)			
	Rated current (A)	*		
	BIL (kVpeak)	*		
	Switching Impulse Withstand Voltage, if applicable (kVpeak)	*		
	Power Frequency Dry/Wet Withstand Voltage (kVrms)	*		
	Creepage distance (mm)	*		
	Cantilever strength (kN)	*		
	Mounting details			
	Hole circle diameter of the flange (mm)	*		
	Number of bolts	*		
	Hole diameter (mm)	*		
	Terminal			
	Type	*		
	Size	*		
	No. of holes, if applicable	*		
	Neutral Bushings:			
	Manufacturer	*		
	Type designation	*		
	Material	*		
	Location (top, side, others)			
	Terminal take-off angle (vertical, horizontal, angle)			
	Rated Voltage (kV)	*		

6.0 DATA SCHEDULE

OIL IMMERSED SHUNT REACTOR 33kV THROUGH 380kV

REFERENCE

SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4.3.23	(Continued)			
	Rated Current (A)	*		
	BIL (kVpeak)	*		
	Power Frequency Dry/Wet Withstand Voltage (kVrms)	*		
	Creepage distance (mm)	*		
	Cantilever strength (kN)	*		
	Mounting details			
	Hole circle diameter of the flange (mm)	*		
	Number of bolts	*		
	Hole diameter (mm)	*		
	Terminal			
	Type	*		
	Size	*		
	No. of holes (if applicable)	*		
4.3.24	Bushing Current Transformers for W.T.I.			
	Manufacturer	*		
	Type Designation	*		
	Ratio	*		
	Accuracy Class	*		
	Neutral Bushing Current Transformer			
	Manufacturer	*		
	Type Designation	*		
	No. of CTs per Phase			
	Continuous Thermal Current Rating Factor			
	- Multi Ratio CTs (MRCT)			
	- Single Ratio CTs			
	Rated Short Time Withstand Current			
	- Thermal I_{th} (kA)	*		
	- Rated Dynamic current	$2.6 \times I_{th}$		
	Short Time Thermal Current duration (sec.)	*		
	Rated primary short circuit current I_{PSC} (kA)	*		

6.0 DATA SCHEDULE

OIL IMMERSED SHUNT REACTOR 33kV THROUGH 380kV

REFERENCE

SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4.3.24	(Continued)			
	Temperature Rise (°C)	*		
	Core No.			
	Type of Protection (differential etc.)			
	Current Ratio at specified tap			
	Accuracy Class			
	Burden (VA)/Resistive Burden- R_b (ohms)	*		
	Secondary Winding Resistance at 20°C, R_{ct} (ohms)	*		
	For class TPS CTs per IEC			
	Rated symmetrical short circuit current factor - K_{SSC}	*		
	Dimensioning parameter -K	*		
	Excitation limiting secondary voltage - U_{al} (Volts)	*		
	Accuracy limiting secondary exciting current – I_{al} (mA)	*		
	Secondary excitation current- I_{mag} at half excitation limiting secondary voltage (mA)	*		
	For class C or K CTs per IEEE / Class P CTs per IEC			
	Magnetizing current - I_{mag} (mA)	*		
	Knee point voltage - V_k (Volts)/ Secondary limiting e.m.f	*		
4.3.27	Auxiliary Supplies			
	DC Voltage for Control and Protection. (V_{dc})	125		
4.3.28	Terminations			
	Termination for HV Winding:	Yes/No		
	Open Bushings (oil/Air)			
	Type of conductor			
	Conductor material			
	Conductor size (mm ²)			

6.0 DATA SCHEDULE

OIL IMMERSED SHUNT REACTOR 33kV THROUGH 380kV

REFERENCE

SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4.3.28	<i>(Continued)</i>			
	Cable Box:	Yes/No		
	Type of cable			
	Cable size (mm ²)			
	Material			
	Number of phase			
	Method of termination (Pothead, stress cone, heat shrinkable)			
	Number of terminations			
	Terminal enclosure required	Yes/No		
	Type (Air, Oil)			
	Incoming cable take off method (Vertical, horizontal, Angle to horizontal)			
	GIS (Oil/SF6):	Yes/No		
	(For details refer to 32-TMSS-02 Data Schedule and attach relevant data)			
	Bus Duct:	Yes/No		
	(If bus duct is required, full details will follow order Placement)			
	Pressure Relief Device for Oil Cable Box			
	Manufacturer	*		
	Type Designation	*		
	Number of Pressure Relief Device(s)	*		
	Pressure Range for Operation (From to kPa)	*		
	Resealing Pressure (kPa)	*		
	Number of alarm/trip contacts	2		
	Alarm Contact Current Rating at 125 Vdc (A)	*		
4.3.29	Surge Arresters	Yes/No		
	Provision for Surge Arresters Mounting Required (If surge arresters are required Data Schedule of 35-TMSS-01 shall be completed and attached by specifying engineer)			

6.0 DATA SCHEDULE

OIL IMMERSED SHUNT REACTOR 33kV THROUGH 380kV

REFERENCE SECTION NO.	DESCRIPTION	'A'	'B'	'C'
4.3.30	Reactor Oil (Manufacturer shall fill up column 'B' of 54-TMSS-01 data schedule)			
4.3.31	Online Gas Analyzer with moisture Analyze	Yes/No		
<u>ADDITIONAL INFORMATION</u>				
	Approximate Shipping Dimension			
5.5	Special Tests Please list special tests that shall be required			

6.0 DATA SCHEDULE




OIL IMMERSED SHUNT REACTOR 33kV THROUGH 380kV




- A. ADDITIONAL TECHNICAL INFORMATION OR FEATURES TO BE FURNISHED BY NATIONAL GRID SAUDI ARABIA:
- B. ADDITIONAL SUPPLEMENTARY DATA OR FEATURES PROPOSED BY BIDDER/VENDOR/SUPPLIER/CONTRACTOR:
- C. OTHER PARTICULARS TO BE FILLED UP BY BIDDER/VENDOR/SUPPLIER/ CONTRACTOR:




	Actual Manufacturer of Equipment/Material	Vendor/Supplier/ Contractor
Name of the Company	_____	_____
Location and address	_____ _____ _____	_____ _____ _____
Name and Signature of authorized representative and date	_____ _____ _____	_____ _____ _____
Official Seal/Stamp of the Company & Date	_____ _____	_____ _____




APPENDIX-3

PROTECTION REQUIREMENTS




				NATIONAL GRID SA		الشركة الوطنية لنقل الكهرباء				
<div>DOCUMENT NO.</div> <div>1</div> <div>2</div> <div>3</div> <div>NO.</div> <div>1</div> <div>2</div> <div>3</div> <div>REVISIONS</div> <div>DEPARTMENT</div> <div>PROTECTION ENGINEERING</div> <div>PREPARED BY</div> <div>Umer Ehsan</div> <div></div> <div>DATE: 11/ 09/ 2024</div> <div>APPROVED BY</div> <div>Umer Ehsan</div> <div></div> <div>DATE: 11/ 09/ 2024</div> <div>CERTIFIED BY</div> <div>Murshed A. Al-Taleb</div> <div></div> <div>DATE: 11/ 09/ 2024</div> <div>THIS DOCUMENT IS NOT TO BE USED FOR CONSTRUCTION OR FOR ORDERING MATERIALS UNTIL CERTIFIED AND DATED</div>				<div>PROTECTION ENGINEERING</div> <div>DEPARTMENT</div> <div>APPENDIX</div> <div>PROTECTION CT REQUIREMENTS FOR PURCHASE CONTRACT FOR EHV TRANSFORMERS AND REACTORS (24CM335)</div>						
DRAWING CONTROL SHEET				Protection CT Requirements for Purchase Contract for EHV Transformers and Reactors (24CM335)		PLANT NO.	INDE	DOCUMENT NO.	PAGE NO.	REV.
XT-XX						SE1057	A	24CM335	1 OF 9	1

DOCUMENT NO.				NATIONAL GRID SA					الشركة الوطنية لنقل الكهرباء		
	<h3>Contents</h3> <p>A. 302.5/402.5/502.5 MVA, 380/132/13.8kV, YNa0d1 302.5/402.5/502.5 MVA, 380/115/13.8kV, YNa0d1 302.5/402.5/502.5 MVA, 380/110/13.8kV, YNa0d1</p> <p>B. 80/100 MVA, 380/33 kV, YNyn0+d1</p> <p>C. 60/80/100/120/150 MVAR, 380kV Bus Shunt Reactor</p> <p>D. 60/80/100/120/150 MVAR, 380kV Line Reactor</p>										
	NO.	1	2	3							
	REVISIONS										
DEPARTMENT					PROTECTION ENGINEERING						
<u>PREPARED BY</u> Umer Ehsan  DATE: 11/ 09/ 2024											
<u>APPROVED BY</u> Umer Ehsan  DATE: 11/ 09/ 2024											
<u>CERTIFIED BY</u> Murshed A. Al-Taleb  DATE: 11/ 09/ 2024											
THIS DOCUMENT IS NOT TO BE USED FOR CONSTRUCTION OR FOR ORDERING MATERIALS UNTIL CERTIFIED AND DATED											
DRAWING CONTROL SHEET					Protection CT Requirements for Purchase Contract for EHV Transformers and Reactors (24CM335)		PLANT NO.	INDE	DOCUMENT NO.	PAGE NO.	REV.
							SE1057	A	24CM335	2 OF 9	1
XT-XX											

DOCUMENT NO.	NATIONAL GRID SA			الشركة الوطنية لنقل الكهرباء				
	A. <u>302.5/402.5/502.5 MVA, 380/132/13.8kV, YNa0d1</u>							
	<u>302.5/402.5/502.5 MVA, 380/115/13.8kV, YNa0d1</u>							
	<u>302.5/402.5/502.5 MVA, 380/110/13.8kV, YNa0d1</u>							
	1- <u>380 KV Extra High Voltage Bushings Side</u>							
	CT#	Ratio [A/A]	Class	Vk [V]	Rct [Ω]	Imag [mA]	Burden [VA]	Application
	CTB-1	3000/1	PX	≥ 3600	≤ 7	≤ 25	-	TEE Protection Set-1
		2000/1		≥ 2400	≤ 5	≤ 35		
	CTB-2	3000/1	PX	≥ 3600	≤ 7	≤ 25	-	TEE Protection Set-2
		2000/1		≥ 2400	≤ 5	≤ 35		
CTB-16	49WT – For Winding Temperature as per NG standard / as per PTS							
NO.	1	2	3					
REVISIONS								
DEPARTMENT								
PROTECTION ENGINEERING								
PREPARED BY								
Umer Ehsan								
								
DATE: 11/ 09/ 2024								
APPROVED BY								
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DATE: 11/ 09/ 2024								
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DRAWING CONTROL SHEET				Protection CT Requirements for Purchase Contract for EHV Transformers and Reactors (24CM335)				
XT-XX								
				PLANT NO.	INDE	DOCUMENT NO.	PAGE NO.	REV.
				SE1057	A	24CM335	3 OF 9	1

DOCUMENT NO.	NATIONAL GRID SA			الشركة الوطنية لنقل الكهرباء						
	4- 13.8 KV Tertiary Bushings									
	CT#	Ratio [A/A]	Class	Vk [V]	Rct [Ω]	Imag [mA]	Burden [VA]	Applic ation	Location	
	CT-9	800- 100/1	5P20				15	OC/ EF	Inside Delta (3 CTs)	
	CT10-1	800/1	X	≥ 500	≤ 1	≤ 25	-	87T-1	Outside Delta (3 CTs)	
	CT10-2	800/1	X	≥ 500	≤ 1	≤ 25	-	87T-2	Outside Delta (3 CTs)	
	CTB-11	800- 100/1	5P20				15	51G	In Earth Connect ion (1 CT only)	
	CTB-18	49WT – For Winding Temperature As per NG standard								
	The above shall be considered a minimum requirement but in all cases the each and every Protection core CT must be justified for the requirement in accordance with the Relay Manufactures recommendations. The CT's shall have adequate performance to enable the associated protection to perform their intended functions without any limitation caused by saturation and an X/R ratio up to as per PTS. All CTs shall have continuous thermal Current Rating factor of 1.2 at 55°C.									
NO.	1	2	3							
REVISIONS										
DEPARTMENT PROTECTION ENGINEERING										
PREPARED BY Umer Ehsan  DATE: 11/ 09/ 2024										
APPROVED BY Umer Ehsan  DATE: 11/ 09/ 2024										
CERTIFIED BY Murshed A. Al-Taleb  DATE: 11/ 09/ 2024										
THIS DOCUMENT IS NOT TO BE USED FOR CONSTRUCTION OR FOR ORDERING MATERIALS UNTIL CERTIFIED AND DATED										
DRAWING CONTROL SHEET				Protection CT Requirements for Purchase Contract for EHV Transformers and Reactors (24CM335)		PLANT NO.	INDE X	DOCUMENT NO.	PAGE NO.	REV.
XT-XX						SE1057	A	24CM335	4 OF 9	1

DESIGNATION					NATIONAL GRID SA				الشركة الوطنية لنقل الكهرباء				
	B. 80/100 MVA, 380/33 kV, YNyn0+d1, X/R= as per PTS												
	1- 380 KV Extra High Voltage Bushings Side												
	CT#		Ratio [A/A]	Class	Vk [V]	Rct [Ω]	Imag [mA]	Burden [VA]	Application				
	CTB-1		3000/1	PX	≥ 3600	≤ 7	≤ 25	-	TEE Protection Set-1				
			2000/1		≥ 2400	≤ 5	≤ 35						
	CTB-2		3000/1	PX	≥ 3600	≤ 7	≤ 25	-	TEE Protection Set-2				
			2000/1		≥ 2400	≤ 5	≤ 35						
	CT		49WT – For Winding Temperature as per NG standard										
	2- 380 KV Extra High Voltage Neutral Bushing Side												
CT#		Ratio [A/A]	Class	Vk [V]	Rct [Ω]	Imag [mA]	Burden [VA]	Application					
NCT-1		2000-1200-800-400/1	PX	≥ 360	≤ 1	≤ 50 @ 400/1	-	REF-1					
NCT-2		2000-1200-800-400/1	PX	≥ 360	≤ 1	≤ 50 @ 400/1	-	REF-2					
3- 33 KV Medium Voltage Bushings Side													
CT#		Ratio [A/A]	Class	Vk [V]	Rct [Ω]	Imag [mA]	Burden [VA]	Application					
CTB-15		As per NG standard						AVR					
CTB-13		As per NG standard						49W					
4- 33 KV MV Neutral Bushings													
CT#		Ratio [A/A]	Class	Vk [V]	Rct [Ω]	Imag [mA]	Burden [VA]	Application					
NCT-3		2000/1	PX	≥ 600	≤ 6	50	-	REF-1					
NCT-4		2000/1	PX	≥ 600	≤ 6	50	-	REF-2					
NCT-5		3000-1500/1	5P20	-	-	-	30	SBEF-1					
NCT-6		3000-1500/1	5P20	-	-	-	30	SBEF-2					
30VA 5P20 (at lowest ratio) CT with suitable CT Ratio as per the power and voltage rating for earth fault protection of Tertiary winding, subject to PED approval.													
DRAWING CONTROL SHEET					Protection CT Requirements for Purchase Contract for EHV Transformers and Reactors (24CM335)				PLANT NO.	INDE	DOCUMENT NO.	PAGE NO.	REV.
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<p><u>PREPARED BY</u></p> <p>Umer Ehsan</p> <p></p> <p>DATE: 11/ 09/ 2024</p>															
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REVISION


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REVISIONS

DEPARTMENT

PROTECTION ENGINEERING




PREPARED BY
Umer Ehsan

DATE: 11/ 09/ 2024

APPROVED BY
Umer Ehsan

DATE: 11/ 09/ 2024

CERTIFIED BY
Murshed A. Al-Taleb

DATE: 11/ 09/ 2024

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APPENDIX-4

TRAINING REQUIREMENTS




APPENDIX-5

OPERATIONAL SPARE PARTS REQUIREMENTS

APPENDIX-6

SPECIAL TOOLS & EQUIPMENT REQUIREMENTS

DESCRIPTION	NATIONAL GRID SA			الشركة الوطنية لنقل الكهرباء		
	<div><div><div><div>نقل الكهرباء</div><div>National Grid SA</div><div>إحدى شركات الشركة السعودية للكهرباء</div><div>Subsidiary of Saudi Electricity Company</div></div></div></div>					
	<div>APPENDIX</div> <div>FOR</div> <div>SPECIAL TOOLS & EQUIPMENT</div>					

DESCRIPTION	NATIONAL GRID SA			الشركة الوطنية لنقل الكهرباء				
	<div>A. Power transformer and Bus Reactor:</div> <div>Tools for 50/67MVA, 80/100MVA,400MVA ,115/13.8kV,110/13.8 kV,132/13.8kV ,132/33kV ,230/115/34.5 kV, Transformer & 230 kV 80 MVAR,132kV 40MVAR bus reactor.</div> <div><div>1. One (1) set Lifting jacks (4nos) each, Jigs or special bolts, etc for lifting core and winding for TRANSFORMERS AND BUS REACTOR.</div><div>2. One (1) set Open wrenches, size 6", 8" & 10"</div><div>3. One (1) set Adjustable wrenches, size 6", 8" & 10"</div><div>4. One (1) set Socket wrenches.</div><div>5. One (1) set Torque wrench.</div><div>6. One (1) set C –Clamp.</div><div>7. One (1) set Manila rope 18dia, 10m.</div><div>8. One (1) set Wire rope 6x37, 38dia, 15m</div></div>							
	NO.	١	٢	٣				
	REVISIONS							
DEPARTMENT PCDD								
<div>PREPARED BY Project Engineers</div> <div></div> <div>Babar Khan (Project Engineers)</div> <div>DATE: 14/07/2024</div>								
<div>APPROVED BY Group Leaders</div> <div></div> <div>Babar Khan (Group Leaders)</div> <div>DATE: 14/07/2024</div>								
<div>CERTIFIED BY NOVEL CONTRACT PROCUREMENT DIVISION MANAGER</div> <div></div> <div>Sultan Ibrahim Al-Rayes (Division Manager)</div> <div>DATE: 14/07/2024</div>								
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